On some Ramanujan formulas: new possible mathematical developments and mathematical connections with the mass value of candidate "glueball" $f_0(1710)$ meson, other particles and the Black Hole entropies.

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Abstract

In the present research thesis, we have obtained various and interesting new possible mathematical results concerning various Ramanujan's formulas. Furthermore, we have described new possible mathematical connections with the mass value of candidate "glueball" $f_0(1710)$ meson, other particles and with the Black Hole entropies.

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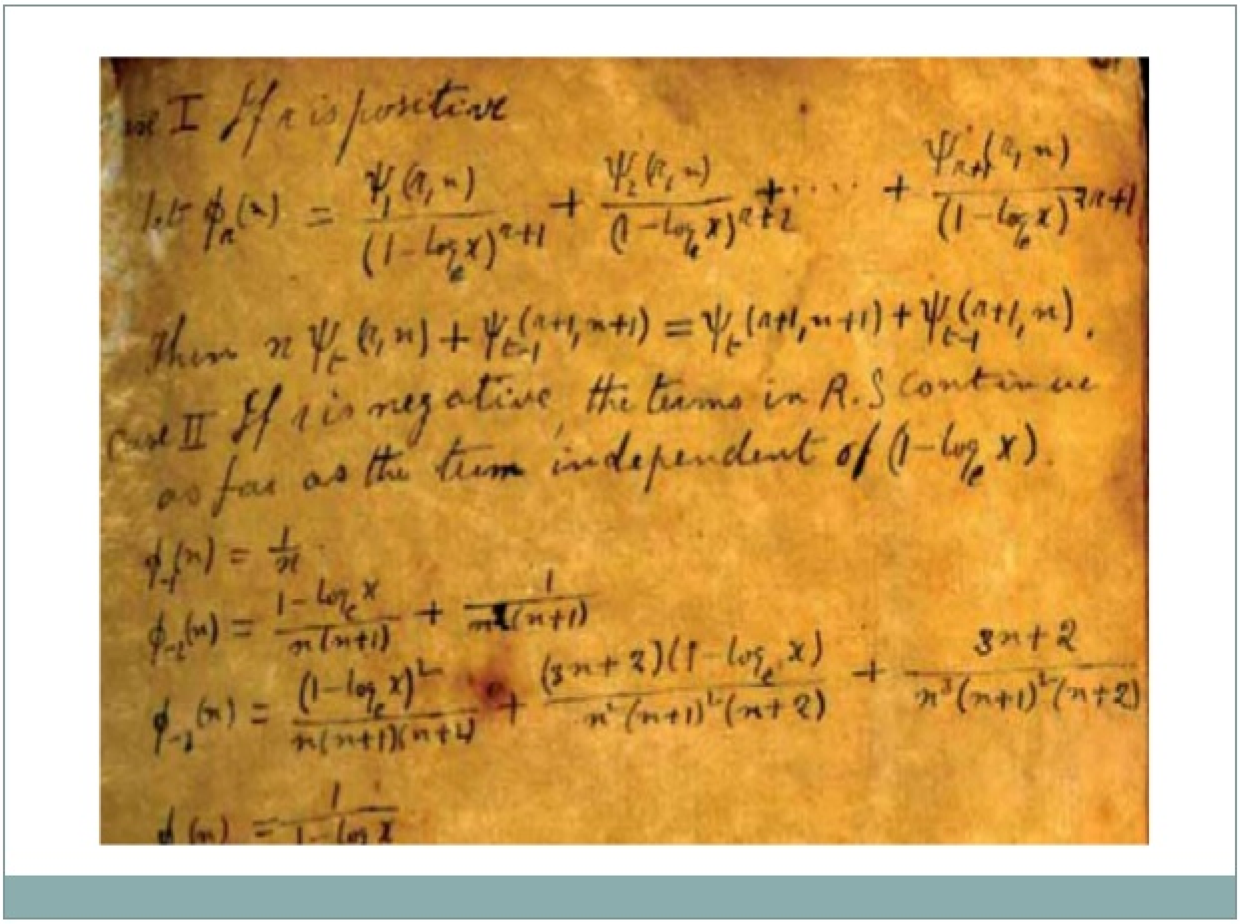
https://iforindian.wordpress.com/2015/12/22/the-man-who-knew-infinity/

Srinivasa Ramanujan

In mathematics, there is a distinction between having an insight and having a proof. Ramanujan's talent suggested a plethora of formulae that could then be investigated in depth later. It is said that Ramanujan's discoveries are unusually rich and that there is often more to them than initially meets the eye. As a by-product, new directions of research were opened up. Examples of the most interesting of these formulae include the intriguing infinite series for π, one of which is given below

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}.$$

Analysis of some Ramanujan's formulas



Case I If r is positive

Let $\phi_r(x) = \frac{\psi_1(r,n)}{(1-\log_e x)^{n+1}} + \frac{\psi_2(r,n)}{(1-\log_e x)^{n+2}} + \cdots + \frac{\psi_{r+1}(r,n)}{(1-\log_e x)^{2n+1}}$

Then $n\psi_t(r,n)+\psi_{t-1}(r+1,n+1)=\psi_t(r+1,n+1)+\psi_{t-1}(r+1,n)$.

Case II If r is negative the terms in R.S continue as far as the term independent of $(1-\log_e x)$.

$\phi_{-1}(n)=\frac{1}{n}$

$\phi_{-2}(n)=\frac{1-\log_e x}{n(n+1)}+\frac{1}{n(n+1)}$

$\phi_{-3}(n)=\frac{(1-\log_e x)^2}{n(n+1)(n+2)}+\frac{(3n+2)(1-\log_e x)}{n^2(n+1)^2(n+2)}+\frac{3n+2}{n^3(n+1)^2(n+2)}$

$\phi(n)=\frac{1}{1-\log x}$

https://www.slideshare.net/charankumarklu/srinivasa-ramanujan-16709403

We analyze the last three formulas of above manuscript.

1/n for n = 2

1/2 = 0.5

(([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2)))/(((2^3(2+1)^2(2+2)))]))

Input:

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{1}{36}+\frac{1}{18}(1+\log(12))+\frac{1}{24}(1+\log(12))^2$$

Decimal approximation:

- More digits

0.7274076343383593606803213206652071171849243500650439879 28...

Open code

0.727407634338359360680321320665207117184924350065043987928

Property:

$$\frac{1}{36}+\frac{1}{18}(1+\log(12))+\frac{1}{24}(1+\log(12))^2 \text{ is a transcendental number}$$

Alternate forms:

- More

$$\frac{1}{72}(9+\log(12)(10+\log(1728)))$$

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$$\frac{1}{72}\left(9+3\log^2(12)+10\log(12)\right)$$

Open code

$$\frac{1}{8}+\frac{\log^2(12)}{24}+\frac{5\log(12)}{36}$$

Open code

Continued fraction:

- Linear form

$$\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{60+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{14+\cfrac{1}{2+\cfrac{1}{26+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}}$$

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Alternative representations:

- More

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)=\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2$$

Open code

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)=\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2$$

Open code

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)=\frac{8}{144}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)^2$$

Series representations:

- More

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)=\frac{1}{72}\left(9+10\log(11)+3\log^2(11)-10\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}-6\log(11)\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}\right)^2\right)$$

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$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)=\frac{1}{72}\left(9+20\,i\,\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor-12\pi^2\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor^2+10\log(x)+12\,i\,\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor\log(x)+3\log^2(x)-10\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}-12\,i\,\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}-6\log(x)\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}\right)^2\right)\quad \text{for } x<0$$

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)=\frac{1}{72}\left(9+10\left(\operatorname{Res}_{s=0}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)+3\left(\operatorname{Res}_{s=0}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)^2+10\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}+6\left(\operatorname{Res}_{s=0}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}+3\left(\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)^2\right)$$

Integral representations:

$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)=\frac{1}{72}\left(9+10\int_1^{12}\frac{1}{t}\,dt+3\left(\int_1^{12}\frac{1}{t}\,dt\right)^2\right)$$

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$$\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)=$$

$$\frac{36\pi^2-20\,i\,\pi\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{11^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds-3\left(\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{11^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)^2}{288\,\pi^2}\quad\text{for}$$

$-1<\gamma<0$

7/(Pi) * (([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2)))/(((2^3(2+1)^2(2+2)))]))

Input:

$$\frac{7}{\pi}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$\frac{7\left(\frac{1}{36}+\frac{1}{18}(1+\log(12))+\frac{1}{24}(1+\log(12))^2\right)}{\pi}$$

Decimal approximation:

- More digits

1.620787289068245137853523120915293749474984109581471410593...

This value 1,62078 is very near to the golden ratio. It can be defined a golden number. We define golden numbers those in the range that goes from 1.6 to 1,675, then an interval of golden ratio1.61803398

Alternate forms:

- More

$$\frac{7(9+\log(12)(10+\log(1728)))}{72\,\pi}$$

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$$\frac{7\left(9+3\log^2(12)+10\log(12)\right)}{72\,\pi}$$

Open code

$$\frac{7}{8\,\pi}+\frac{7\log^2(12)}{24\,\pi}+\frac{35\log(12)}{36\,\pi}$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{11+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{15+\cfrac{1}{4+\cfrac{1}{6+\cfrac{1}{7+\cfrac{1}{2+\cfrac{1}{19+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

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Alternative representations:

- More

$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)7}{\pi}=\frac{7\left(\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2\right)}{\pi}$$

Open code

$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)7}{\pi}=\frac{7\left(\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2\right)}{\pi}$$

$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)7}{\pi}=\frac{7\left(\frac{8}{144}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)^2\right)}{\pi}$$

Series representations:

- More

$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)7}{\pi} = \frac{1}{72\pi} 7\left(9+10\log(11)+3\log^2(11)-10\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}-6\log(11)\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}\right)^2\right)$$

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$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)7}{\pi} = -\frac{1}{72\pi} 7\left(-9-20 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor+12\pi^2\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor^2 - 10\log(x)-12 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor\log(x)-3\log^2(x)+ 10\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}+12 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}+ 6\log(x)\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}-3\left(\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}\right)^2\right) \quad \text{for } x<0$$

$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)7}{\pi} = \frac{1}{72\pi} 7\left(9+10\left(\operatorname{Res}_{s=0}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)+3\left(\operatorname{Res}_{s=0}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)^2+ 10\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}+6\left(\operatorname{Res}_{s=0}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right) \sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}+3\left(\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\,\Gamma(-s)\,\Gamma(1+s)}{s}\right)^2\right)$$

Integral representations:

$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)7}{\pi} = \frac{7\left(9+10\int_1^{12}\frac{1}{t}\,dt+3\left(\int_1^{12}\frac{1}{t}\,dt\right)^2\right)}{72\pi}$$

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$$\frac{\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)7}{\pi} = \frac{7\left(36\pi^2-20 i\pi\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{11^{-s}\Gamma(-s)^2\Gamma(1+s)}{\Gamma(1-s)}ds-3\left(\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{11^{-s}\Gamma(-s)^2\Gamma(1+s)}{\Gamma(1-s)}ds\right)^2\right)}{288\pi^3} \text{ for } -1<\gamma<0$$

sqrt5 * (([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2)))/(((2^3(2+1)^2(2+2)))]))

Input:

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)$$

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- $\log(x)$ is the natural logarithm

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Exact result:

$$\sqrt{5}\left(\frac{1}{36}+\frac{1}{18}(1+\log(12))+\frac{1}{24}(1+\log(12))^2\right)$$

Decimal approximation:

- More digits

1.626532917732881789867143275628355288028701467384440287973...

Open code

This value 1,6265329.. is very near to the golden ratio. It can be defined a golden number

Property:

$$\sqrt{5}\left(\frac{1}{36}+\frac{1}{18}(1+\log(12))+\frac{1}{24}(1+\log(12))^2\right) \text{ is a transcendental number}$$

Alternate forms:

- More

$$\frac{1}{72}\sqrt{5}\,(9+\log(12)(10+\log(1728)))$$

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$$\frac{1}{72}\sqrt{5}\left(9+3\log^2(12)+10\log(12)\right)$$

Open code

$$\frac{\sqrt{5}}{8}+\frac{1}{24}\sqrt{5}\log^2(12)+\frac{5}{36}\sqrt{5}\log(12)$$

Open code

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{40+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{10+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}}$$

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Alternative representations:

- More

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2\right)\sqrt{5}$$

Open code

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2\right)\sqrt{5}$$

Open code

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1+\operatorname{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\operatorname{Li}_1\left(1-\frac{1}{12}\right)\right)^2\right)\sqrt{5}$$

Series representations:

- More

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=\frac{1}{72}\sqrt{5}\left(9+10\log(11)+3\log^2(11)-10\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}-6\log(11)\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}\right)^2\right)$$

Open code

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$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)= -\frac{1}{72}\sqrt{5}\left(-9-20 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor+12\pi^2\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor^2-10\log(x)-12 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor\log(x)-3\log^2(x)+10\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}+12 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}+6\log(x)\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}-3\left(\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}\right)^2\right) \quad \text{for } x<0$$

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)= \frac{1}{72}\sqrt{5}\left(9+10\left(\operatorname{Res}_{s=0}\frac{11^{-s}\Gamma(-s)\Gamma(1+s)}{s}\right)+3\left(\operatorname{Res}_{s=0}\frac{11^{-s}\Gamma(-s)\Gamma(1+s)}{s}\right)^2+10\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\Gamma(-s)\Gamma(1+s)}{s}+6\left(\operatorname{Res}_{s=0}\frac{11^{-s}\Gamma(-s)\Gamma(1+s)}{s}\right)\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\Gamma(-s)\Gamma(1+s)}{s}+3\left(\sum_{j=1}^{\infty}\operatorname{Res}_{s=j}\frac{11^{-s}\Gamma(-s)\Gamma(1+s)}{s}\right)^2\right)$$

Integral representations:

$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)= \frac{1}{72}\sqrt{5}\left(9+10\int_1^{12}\frac{1}{t}\,dt+3\left(\int_1^{12}\frac{1}{t}\,dt\right)^2\right)$$

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$$\sqrt{5}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{\sqrt{5}\left(36\pi^2-20\,i\,\pi\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{11^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds-3\left(\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{11^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)^2\right)}{288\pi^2}\quad\text{for}$$
$$-1<\gamma<0$$

sqrt4.96 * ((([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2))/(((2^3(2+1)^2(2+2)))]))

Input:

$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- Fewer digits
- More digits

1.620013721487843592305159877481903579316155571704957149040...

This value 1,620013 is very near to the golden ratio. It can be defined a golden number

Alternative representations:

- More

$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\left(\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.96}$$

Open code

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$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\left(\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.96}$$

Open code

$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\left(\frac{8}{144}\left(1+\text{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\text{Li}_1\left(1-\frac{1}{12}\right)\right)^2\right)\sqrt{4.96}$$

Series representations:

- More

$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.96}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}e^{-1.37624\,k}\binom{\frac{1}{2}}{k}$$

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$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.96}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}\frac{(-0.252525)^k\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\exp\left(i\pi\left\lfloor\frac{\arg(4.96-x)}{2\pi}\right\rfloor\right)\left(9-10\log\left(\frac{1}{12}\right)+3\log^2\left(\frac{1}{12}\right)\right)$$
$$\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(4.96-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\quad\text{for }(x\in\mathbb{R}\text{ and }x<0)$$

Integral representation:

$$\sqrt{4.96}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\left(9-10\int_1^{\frac{1}{12}}\frac{1}{t}\,dt+3\left(\int_1^{\frac{1}{12}}\frac{1}{t}\,dt\right)^2\right)\sqrt{4.96}$$

sqrt4.95 * (([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2)))/(((2^3(2+1)^2(2+2)))]))

Input:

$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- Fewer digits
- More digits

1.618379819184592768786702705321330624676937187687084367464...

1.6183798191845927687867027053213306246769371876870843

This value 1,6183798 is a very good approximation to the golden ratio.

Alternative representations:

- More

$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.95}$$

Open code

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$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.95}$$

Open code

$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1+\operatorname{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\operatorname{Li}_1\left(1-\frac{1}{12}\right)\right)^2\right)\sqrt{4.95}$$

Series representations:

- More

$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times2+2}{2^3(2+1)^2(2+2)}\right)\right)=\frac{1}{72}\sqrt{3.95}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}e^{-1.37372k}\binom{\frac{1}{2}}{k}$$

Open code

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$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.95}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}\frac{(-0.253165)^k\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\exp\left(i\pi\left\lfloor\frac{\arg(4.95-x)}{2\pi}\right\rfloor\right)\left(9-10\log\left(\frac{1}{12}\right)+3\log^2\left(\frac{1}{12}\right)\right)$$
$$\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(4.95-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\quad \text{for } (x\in\mathbb{R} \text{ and } x<0)$$

Integral representation:

$$\sqrt{4.95}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\left(9-10\int_1^{\frac{1}{12}}\frac{1}{t}\,dt+3\left(\int_1^{\frac{1}{12}}\frac{1}{t}\,dt\right)^2\right)\sqrt{4.95}$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{27+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

root of $703x^3 + 88201x^2 - 154180x + 15530$ near $x = 1.61838$ ≈ 1.6183798191845927687890781

$\frac{2399071496\pi}{4657068321} \approx 1.6183798191845927688 1397$

$\frac{1}{\text{root of } 15530x^3 - 154180x^2 + 88201x + 703 \text{ near } x = 0.617902} \approx$ 1.6183798191845927687890781

Where:

(1.618379819184592768 * 4657068321) / 2399071496

Input interpretation:

$$\frac{1.618379819184592768 \times 4657068321}{2399071496}$$

Open code

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Result:

- More digits

3.141592653589793236882550384817710326378701637493841492417...

This result, obviously, coincide with π

Continued fraction:

- Linear form

$$3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1+\cfrac{1}{292+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{14+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$\pi \approx 3.14159265358979323846 26$

$\log(\mathcal{G}_{Ge}) \approx 3.14159265358979323846 26$

$\sqrt{6\,\zeta(2)} \approx 3.14159265358979323846 26$

-

Now, with 4.9454 and 4.9582, that are:

4.9454 = (1.2108+1.2619)/2 * 4 and 4.9582 = (1.2108+1.2683)/2 * 4 where 1.2108, 1.2619 and 1.2683 are Haudorff dimensions and 1.2108 is:

$$2\log_2\left(\frac{\sqrt[3]{27-3\sqrt{78}}+\sqrt[3]{27+3\sqrt{78}}}{3}\right),$$

or root of $2^x - 1 = 2^{(2-x)/2}$

We obtain:

sqrt4.9454 * (([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2)))/(((2^3(2+1)^2(2+2)))]))

Input interpretation:

$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.617627669940794513682360921908945608311992614131127053086...

Alternative representations:

- More

$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$

$$\left(\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.9454}$$

Open code

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$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$
$$\left(\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.9454}$$

Open code

$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$
$$\left(\frac{8}{144}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)^2\right)\sqrt{4.9454}$$

Open code

- $\log_b(x)$ is the base- b logarithm
- $\mathrm{Li}_n(x)$ is the polylogarithm function

Series representations:

- More

$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.9454}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}e^{-1.37255\,k}\binom{\frac{1}{2}}{k}$$

Open code

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$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.9454}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}\frac{(-0.25346)^k\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$
$$\frac{1}{72}\exp\left(i\pi\left\lfloor\frac{\arg(4.9454-x)}{2\pi}\right\rfloor\right)\left(9-10\log\left(\frac{1}{12}\right)+3\log^2\left(\frac{1}{12}\right)\right)$$
$$\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(4.9454-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\quad \text{for } (x\in\mathbb{R} \text{ and } x<0)$$

Open code

- $\binom{n}{m}$ is the binomial coefficient

- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- $\arg(z)$ is the complex argument
- $\lfloor x \rfloor$ is the floor function
- i is the imaginary unit
- $\mathbb{R}$ is the set of real numbers

- Integral representation:

$$\sqrt{4.9454}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2\,(2+1)\,(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2\,(2+1)^2\,(2+2)}+\frac{3\times 2+2}{2^3\,(2+1)^2\,(2+2)}\right)\right)=$$

- $$\frac{1}{72}\left(9-10\int_1^{\frac{1}{12}}\frac{1}{t}\,dt+3\left(\int_1^{\frac{1}{12}}\frac{1}{t}\,dt\right)^2\right)\sqrt{4.9454}$$

1.6176276699407945136823609219089456083119926141311270

This value 1,617627 is very near to the golden ratio. It can be defined a golden number

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{44+\cfrac{1}{4+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{28+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{21\,P-10\,007}{3\,(233\,P-2365)}\approx 1.61762766994079451\,45403$$

$$\frac{1}{29}\left(13+26\,e+8\sqrt{1+e}-29\sqrt{1+e^2}+27\,\pi+7\,\pi^2-60\sqrt{1+\pi}\right)\approx$$

1.617627669940794513664117

$$\frac{2256\,\pi\,\pi! - 6613 + 1888\,\pi - 5067\,\pi^2}{50\,\pi} \approx 1.61762766994079451455 91$$

- P is the plastic constant
- $n!$ is the factorial function

sqrt4.9582 * (([(((1-ln(1/12))^2)))/(((2*(2+1)(2+2)))])) + (([(((3*2+2)(1-ln(1/12)))/(((2^2(2+1)^2*(2+2)))])) + (([(((3*2+2)))/(((2^3(2+1)^2(2+2)))]))

Input interpretation:

$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.619719740711090968190809898835599698324225205607880926308...

This value 1,619719 is very near to the golden ratio. It can be defined a golden number

Alternative representations:

- More

$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log_e\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.9582}$$

Open code

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$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)^2\right)\sqrt{4.9582}$$

Open code

$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=\left(\frac{8}{144}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{8}{288}+\frac{1}{24}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)^2\right)\sqrt{4.9582}$$

Open code

- $\log_b(x)$ is the base- b logarithm
- $\text{Li}_n(x)$ is the polylogarithm function

Series representations:

More

$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.9582}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}e^{-1.37579k}\binom{\frac{1}{2}}{k}$$

Open code

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$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\sqrt{3.9582}\left(9+10\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}+3\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}\right)^2\right)\sum_{k=0}^{\infty}\frac{(-0.25264)^k\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\exp\left(i\pi\left\lfloor\frac{\arg(4.9582-x)}{2\pi}\right\rfloor\right)\left(9-10\log\left(\frac{1}{12}\right)+3\log^2\left(\frac{1}{12}\right)\right)$$
$$\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(4.9582-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\quad \text{for } (x\in\mathbb{R} \text{ and } x<0)$$

Open code

- $\binom{n}{m}$ is the binomial coefficient
- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- $\arg(z)$ is the complex argument
- $\lfloor x\rfloor$ is the floor function
- i is the imaginary unit
- $\mathbb{R}$ is the set of real numbers

- Integral representation:

$$\sqrt{4.9582}\left(\frac{\left(1-\log\left(\frac{1}{12}\right)\right)^2}{2(2+1)(2+2)}+\left(\frac{(3\times 2+2)\left(1-\log\left(\frac{1}{12}\right)\right)}{2^2(2+1)^2(2+2)}+\frac{3\times 2+2}{2^3(2+1)^2(2+2)}\right)\right)=$$
$$\frac{1}{72}\left(9-10\int_1^{\frac{1}{12}}\frac{1}{t}\,dt+3\left(\int_1^{\frac{1}{12}}\frac{1}{t}\,dt\right)^2\right)\sqrt{4.9582}$$

1.6197197407110909681908098988355996983242252056078809

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{137+\cfrac{1}{1+\cfrac{1}{14+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{-428\, e\, e! + 148 + 333\, e + 5070\, e^2}{7622\, e} \approx 1.61971974071109096818487 8$$

$$\frac{4655864421\, \pi}{9030469342} \approx 1.6197197407110909682001 5$$

root of $118 x^3 - 90035 x^2 + 124864 x + 33460$ near $x = 1.61972$ $\approx$

1.6197197407110909681888 36

-

The mean of the two results is:

1/2 * (1.6176276699407945136823609219089456083119926141311270 + 1.6197197407110909681908098988355996983242252056078809)

Input interpretation:

$$\frac{1}{2}\,(1.6176276699407945136823609219089456083119926141311270 + 1.6197197407110909681908098988355996983242252056078809)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

1.6186737053259427409365854103722726533181089098695039 5

Open code

Repeating decimal:
1.61867370532594274093658541037227265331810890986950395

1.61867370532594274093658541037227265331810890986950395

This value 1,6186737 is a good approximation to the value of golden ratio.

Continued fraction:
- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{12+\cfrac{1}{1+\cfrac{1}{14+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive
Possible closed forms:
- More

$$\frac{3}{5}\sqrt{\frac{1145327}{1553149}}\,\pi \approx 1.6186737053259427 54207$$

$$\frac{4}{11}\,\pi\csc^2\left(\frac{1052929}{1055610}\right) \approx 1.6186737053259427 61049$$

$$\frac{2776584071\,\pi}{5388915685} \approx 1.618673705325942740946573$$

- $\csc(x)$ is the cosecant function

We have also:

(((((([(((1-ln(1/12)))/(((2*(2+1)])))))) + ((((([1/(((2^2(2+1))]))))))

Input:

$$\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Exact result:

$$\frac{1}{12}+\frac{1}{6}\,(1+\log(12))$$

Decimal approximation:

- More digits

$0.6641511082980000517049515799731464734664151377572099933329\ldots$

Open code

0.6641511082980000517049515799731464734664151377572099933329

Property:

$\frac{1}{12}+\frac{1}{6}\,(1+\log(12))$ is a transcendental number

Alternate forms:

- More

$$\frac{1}{4}+\frac{\log(12)}{6}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{12}\,(3+2\log(12))$$

Open code

$$\frac{1}{12}\,(3+4\log(2)+2\log(3))$$

Continued fraction:

- Linear form

$$\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{43+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{85+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{17+\cfrac{1}{13+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{12+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Alternative representations:

- More

$$\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}=\frac{1}{6}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{1}{12}$$

Open code

$$\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}=\frac{1}{6}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{1}{12}$$

Open code

$$\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}=\frac{1}{6}\left(1+\text{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{1}{12}$$

Series representations:

- More

$$\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}=\frac{1}{4}+\frac{\log(121)}{12}-\frac{1}{6}\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}=\frac{1}{4}+\frac{1}{3}i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor+\frac{\log(x)}{6}-\frac{1}{6}\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k} \quad \text{for } x<0$$

Open code

$$\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}=\frac{1}{4}+\frac{1}{6}\left\lfloor\frac{\arg(12-z_0)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)+\frac{\log(z_0)}{6}+\frac{1}{6}\left\lfloor\frac{\arg(12-z_0)}{2\pi}\right\rfloor\log(z_0)-\frac{1}{6}\sum_{k=1}^{\infty}\frac{(-1)^k(12-z_0)^k z_0^{-k}}{k}$$

Open code

- $\arg(z)$ is the complex argument
- $\lfloor x\rfloor$ is the floor function
- More information

Integral representations:

$$\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}=\frac{1}{4}+\frac{1}{6}\int_1^{12}\frac{1}{t}\,dt$$

Open code

$$\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}=\frac{1}{4}-\frac{i}{12\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{11^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1<\gamma<0$$

Open code

2 * sqrt[[[[[[((((((((((((([(((1-ln(1/12)))/(((2*(2+1)])))))+(((((([1/(((2^2(2+1))]))))))))))))]]]]]]

Input:

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}}$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$2\sqrt{\frac{1}{12}+\frac{1}{6}(1+\log(12))}$$

Decimal approximation:

- More digits

1.629909332813331738798308138822260132078517498142626328678...

1.629909332813331738798308138822260132078517498142626328678

This value 1,629909 is very near to the golden ratio. It can be defined a golden number

Property:

$2\sqrt{\frac{1}{12}+\frac{1}{6}(1+\log(12))}$ is a transcendental number

Alternate forms:

- More

$\sqrt{1+\frac{2\log(12)}{3}}$

Open code

Enlarge Data Customize A Plaintext Interactive

$\sqrt{\frac{1}{3}(3+2\log(12))}$

Open code

$\sqrt{\frac{1}{3}(3+4\log(2)+2\log(3))}$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{68+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{27+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Alternative representations:

- More

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 2\sqrt{\frac{1}{6}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 2\sqrt{\frac{1}{6}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 2\sqrt{\frac{1}{6}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Series representations:

- More

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = \frac{\sqrt{3+\log(121)-2\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{11}\right)^k}{k}}}{\sqrt{3}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = \frac{\sqrt{3+4 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor+2\log(x)-2\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}}}{\sqrt{3}} \quad \text{for } x<0$$

Open code

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 2\sqrt{\frac{1}{12}+\frac{1}{6}\left(1+2 i\pi\left\lfloor\frac{\arg(12-x)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k(12-x)^k x^{-k}}{k}\right)} \quad \text{for } x<0$$

Open code

- $\arg(z)$ is the complex argument
- $\lfloor x\rfloor$ is the floor function
- More information

Integral representations:

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}} = \sqrt{1+\frac{2}{3}\int_1^{12}\frac{1}{t}\,dt}$$

Open code

$$2\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}} = \sqrt{1-\frac{i}{3\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{11^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds} \quad \text{for } -1<\gamma<0$$

1.992 * sqrt[[[[[[((((((((((((((([(((1-ln(1/12)))/(((2*(2+1)])))))+(((((([1/(((2^2(2+1))])))))))))))))]]]]]]

1.992 = 1.2108 * 3 – 1.6402 = 1.9922 where 1.2108 and 1.6402 are Hausdorff dimensions. The dimension 1.2108 is:

$$2\log_2\left(\frac{\sqrt[3]{27-3\sqrt{78}}+\sqrt[3]{27+3\sqrt{78}}}{3}\right),$$

or root of $2^x - 1 = 2^{(2-x)/2}$

Input:

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.623389695482078411843114906266971091550203428150055823363...

1.6233896954820784118431149062669710915502034281500558

This value 1,623389 is very near to the golden ratio. It can be defined a golden number

Alternative representations:

- More

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}} = 1.992\sqrt{\frac{1}{6}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.992\sqrt{\frac{1}{6}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.992\sqrt{\frac{1}{6}\left(1+\text{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

Series representations:

- More

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.992\sqrt{\frac{1}{4}+\frac{1}{6}\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.992\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{3}{4}-\frac{1}{6}\log\left(\frac{1}{12}\right)\right)^k\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} =$$
$$1.992\sqrt{\frac{1}{12}\left(3-4i\pi\left\lfloor\frac{\arg\left(\frac{1}{12}-x\right)}{2\pi}\right\rfloor-2\log(x)+2\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{1}{12}-x\right)^k x^{-k}}{k}\right)} \quad \text{for } x<0$$

Open code

- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- $\arg(z)$ is the complex argument
- $\lfloor x\rfloor$ is the floor function
- i is the imaginary unit
- More information

Integral representation:

$$1.992\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.992\sqrt{\frac{1}{4}-\frac{1}{6}\int_1^{\frac{1}{12}}\frac{1}{t}\,dt}$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{12+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{27+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{45+\cfrac{1}{24+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{7+650\,e-6\,e^2}{2\,(316+77\,e+e^2)} \approx 1.62338969548207841 23692$$

$$\text{root of } 9974\,x^3+1970\,x^2-71519\,x+68240 \text{ near } x=1.62339 \approx$$

1.62338969548207841 18872583

$$\pi \; \text{root of } 65820\,x^3-21651\,x^2+3308\,x-5010 \text{ near } x=0.516741 \approx$$

1.62338969548207841 1857963

1.9649 * sqrt[[[[[[((((((((((((([(((1-ln(1/12)))/(((2*(2+1)])))))+((((([1/(((2^2(2+1))]))))))))))))))]]]]]]

Where 1.9649 = 1.5849 * 2.04- 1.2683 where 1.5849, 2.04 (mean between 2.06 and 2.02) and 1.2683 are Hausdorff dimension:

Input interpretation:

$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2\,(2+1)}+\frac{1}{2^2\,(2+1)}}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.6013044240224577667823978309859294667605395160502232366 09...

1.601304424022457766782397830985929466760539516050 2232

This value 1,601304 is very near to the golden ratio. It can be defined a golden number. Furthermore, this result is a good approximation to the value of the electric charge of the positron.

Alternative representations:

- More

$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.9649\sqrt{\frac{1}{6}\left(1-\log_e\left(\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

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$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.9649\sqrt{\frac{1}{6}\left(1-\log(a)\log_a\left(\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Open code

$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.9649\sqrt{\frac{1}{6}\left(1+\mathrm{Li}_1\left(1-\frac{1}{12}\right)\right)+\frac{1}{12}}$$

Series representations:

- More

$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.9649\sqrt{\frac{1}{4}+\frac{1}{6}\sum_{k=1}^{\infty}\frac{(-1)^k\left(-\frac{11}{12}\right)^k}{k}}$$

Open code

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$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.9649\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{3}{4}-\frac{1}{6}\log\left(\frac{1}{12}\right)\right)^k\left(-\frac{1}{2}\right)_k}{k!}$$

Open code

$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} =$$

$$1.9649\sqrt{\frac{1}{12}\left(3-4 i \pi\left\lfloor\frac{\arg\left(\frac{1}{12}-x\right)}{2\pi}\right\rfloor-2\log(x)+2\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{1}{12}-x\right)^k x^{-k}}{k}\right)} \quad \text{for } x<0$$

Open code

- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- $\arg(z)$ is the complex argument
- $\lfloor x \rfloor$ is the floor function
- i is the imaginary unit
- More information

Integral representation:

$$1.9649\sqrt{\frac{1-\log\left(\frac{1}{12}\right)}{2(2+1)}+\frac{1}{2^2(2+1)}} = 1.9649\sqrt{\frac{1}{4}-\frac{1}{6}\int_1^{\frac{1}{12}}\frac{1}{t}\,dt}$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{30+\cfrac{1}{15+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{13+\cfrac{1}{2+\cfrac{1}{8+\cfrac{1}{3+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\log\left(\frac{1}{240}\left(496-97\sqrt{2}+95e+17e^2-90\pi+74\pi^2\right)\right)\approx 1.60130442402245776677880 7$$

$$\pi \; \text{root of } 46981x^3-62628x^2+937x+9572 \text{ near } x=0.509711 \approx 1.601304424022457766771279$$

$$\frac{1415933283\pi}{2777913764}\approx 1.601304424022457766773069$$

From sum of the three results multiplied by 1/3, we obtain the following mean value:

1/3 * (1.6013044240224577667823978309859294667605395160502232+1.6233896954820784118431149062669710915502034281500558+1.629909332813331738798308138822260132078517498142626328678)

Input interpretation:

$$\frac{1}{3}(1.6013044240224577667823978309859294667605395160502232 + 1.6233896954820784118431149062669710915502034281500558 + 1.629909332813331738798308138822260132078517498142626328678)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1.618201150772622639141273625358386896796420147447635109559...

Open code

1.618201150772622639141273625358386896796420147447635109559

This value 1,6182011 is a good approximation to the golden ratio.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{16+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{\log\left(\frac{19643481}{43031}\right)}{\log(44)} \approx 1.618201150772622366059$$

root of $685 x^4 - 2233 x^3 + 70 x^2 - 2430 x + 8514$ near $x = 1.6182$ ≈ 1.618201150772622639133167

$$\frac{3078491603\,\pi}{5976615824} \approx 1.6182011507726226391481414$$

From the following expression based on the multiplication of the three original results, we obtain:

(((exp(0.5 * 0.7274076343383593606803213206652071171849243500650439879 28 * 0.6641511082980000517049515799731464734664151377572099933 29))))^2

Input interpretation:

$$\exp^2(0.5 \times 0.727407634338359360680321320665207117184924350065043987928 \times 0.664151108298000051704951579973146473466415137757209993329)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.621105925722800466699514291963014385232411449473208761283...

1.62110592572280046669951429196301438523241144947320 87

This value 1,6211059 is very near to the golden ratio. It can be defined a golden number

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{21+\cfrac{1}{1+\cfrac{1}{20+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$2\sqrt{\frac{12144755}{18485277}} \approx 1.621105925722800054388$

$\frac{667459178\pi}{1293490337} \approx 1.6211059257228004666606217$

root of $143x^5 + 191x^4 - 396x^3 - 873x^2 + 340x + 510$ near $x = 1.62111$ ≈ 1.6211059257228004667533 3

(1.6211059257228 * 27^2)+(23.3621)^2

where 23,3621 is a black hole entropy

Input interpretation:

$1.6211059257228 \times 27^2 + 23.3621^2$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

1727.5739362619212

1727.5739362619212

This result is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

Continued fraction:

- Linear form

$$1727 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{7 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{3 + \cfrac{1}{9 + \cfrac{1}{\ldots}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive
Possible closed forms:

- More

$$-\frac{4929}{50}+\frac{5619}{100\,e}+\frac{3321\,e}{5}\approx 1727.57393626192118937$$
$$-\frac{973\,e!}{6}+\frac{989}{6}-\frac{1991}{6\,e}+874\,e\approx 1727.573936261921210256$$
$$\frac{78302}{55}-\frac{5138}{55\,\pi}+\frac{531\,\pi}{5}\approx 1727.57393626192119700$$

Indeed:

(1.6211059257228 * 27^2)+(ln (13996663144))^2

Input interpretation:
$$1.6211059257228\times 27^2+\log^2(13\,996\,663\,144)$$
Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive
Result:

- More digits

1727.5732256476...

This result is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

Alternative representations:

- More

$$1.62110592572280000\times 27^2+\log^2(13\,996\,663\,144)=1.62110592572280000\times 27^2+\log_e^2(13\,996\,663\,144)$$
Open code

Enlarge Data Customize A Plaintext Interactive
$$1.62110592572280000\times 27^2+\log^2(13\,996\,663\,144)=1.62110592572280000\times 27^2+(\log(a)\log_a(13\,996\,663\,144))^2$$
Open code

$$1.62110592572280000\times 27^2+\log^2(13\,996\,663\,144)=1.62110592572280000\times 27^2+(-\mathrm{Li}_1(-13\,996\,663\,143))^2$$
Open code

Series representations:

- More

$$1.62110592572280000 \times 27^2 + \log^2(13\,996\,663\,144) = 1181.78621985192120 + \left(\log(13\,996\,663\,143) - \sum_{k=1}^{\infty} \frac{\left(-\frac{1}{13\,996\,663\,143}\right)^k}{k}\right)^2$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$1.62110592572280000 \times 27^2 + \log^2(13\,996\,663\,144) = 1181.78621985192120 + \left(2 i \pi \left\lfloor \frac{\arg(13\,996\,663\,144 - x)}{2\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (13\,996\,663\,144 - x)^k x^{-k}}{k}\right)^2 \quad \text{for } x < 0$$

Open code

$$1.62110592572280000 \times 27^2 + \log^2(13\,996\,663\,144) = 1181.78621985192120 + \left(\log(z_0) + \left\lfloor \frac{\arg(13\,996\,663\,144 - z_0)}{2\pi} \right\rfloor \left(\log\left(\frac{1}{z_0}\right) + \log(z_0)\right) - \sum_{k=1}^{\infty} \frac{(-1)^k (13\,996\,663\,144 - z_0)^k z_0^{-k}}{k}\right)^2$$

Integral representations:

$$1.62110592572280000 \times 27^2 + \log^2(13\,996\,663\,144) = 1181.78621985192120 + \left(\int_1^{13\,996\,663\,144} \frac{1}{t}\, dt\right)^2$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$1.62110592572280000 \times 27^2 + \log^2(13\,996\,663\,144) = 1181.78621985192120 + \frac{\left(\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{13\,996\,663\,143^{-s}\, \Gamma(-s)^2\, \Gamma(1+s)}{\Gamma(1-s)}\, ds\right)^2}{4 i^2 \pi^2} \quad \text{for } -1 < \gamma < 0$$

From:

Three-dimensional AdS gravity and extremal CFTs at c = 8m

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The cases $c = 24k$, $k \in \mathbb{Z}$, are rather special in that they are the only ones that allow for the possibility of holomorphic factorization. In the self-dual case, where the space of states of the theory consists only of the vacuum representation, holomorphic factorization implies that the partition function factorizes as

$$\mathcal{Z}_c(\tau, \bar{\tau}) = Z_c(\tau)\bar{Z}_c(\bar{\tau})\,, \tag{1.4}$$

with $Z_c(\tau)$ and $\bar{Z}_c(\bar{\tau})$ being separately modular invariant. Although there exists no compelling argument for considering only the cases $c = 24k$, the decomposition (1.2) of the action as a sum of two terms is suggestive of a factorization of the form (1.4), and the absence of CFTs with the required properties at lower central charges points towards the value $c = 24$ above which there is a proliferation of holomorphic CFTs. Be that as it may, the assumption of holomorphic factorization tremendously simplifies things, as one may uniquely determine the partition functions of the sought CFTs by imposing modular invariance and requiring that the primaries associated with black-hole states enter at the highest possible level. For $c = 24$ and $c = 48$, the (holomorphic) partition functions read

$$\begin{aligned} Z_{24}(\tau) &= j(\tau) - 744 \\ &= q^{-1} + 196884\,q + 21493760\,q^2 + 864299970\,q^3 + 20245856256\,q^4 + \dots\,, \end{aligned} \tag{1.5}$$

and

$$
\begin{aligned}
Z_{48}(\tau) &= j^2(\tau) - 1488\, j(\tau) + 159769 \\
&= q^{-2} + 1 + 42987520\, q + 40491909396\, q^2 + 8504046600192\, q^3 + \dots\,, \qquad (1.6)
\end{aligned}
$$

where $j(\tau)$ is the modular j-function and $q = e^{2\pi i\tau}$. The partition function in (1.5) defines a very special theory among the 71 holomorphic CFTs believed to exist at $c = 24$ [14]. It was first constructed by Frenkel, Lepowsky and Meurman [15] (see also [16]) by considering 24 chiral bosons on the Leech lattice and using a $\mathbb{Z}_2$ orbifold to project out the 24 dimension-1 primaries. The 196884 dimension-2 operators correspond to one Virasoro descendant plus 196883 primaries whose number is the dimension of the lowest non-trivial representation of the largest sporadic group, the monster group. In fact, each coefficient in (1.5) equals the number of descendants at this level plus the dimension of an irreducible representation of the monster; this observation forms part of monstrous moonshine, an unexpected connection between modular functions and finite simple groups. For the partition function (1.6) and, in general, all $Z_{24k}(\tau)$ with $k \geqslant 2$, the corresponding CFTs have not been identified, but the number of available lattices in these dimensions makes their existence plausible. Furthermore, the counting of microstates in the CFTs under consideration yields, for all values of k, an entropy that is very close to the corresponding Bekenstein-Hawking entropy of the BTZ black hole. These facts led Witten to propose that three-dimensional quantum gravity with $\ell/16G = k \in \mathbb{Z}$ is dual to the $c = 24k$ series of extremal CFTs. In particular, for the most negative possible value of the cosmological constant, the dual CFT has been conjectured to be the $c = 24$ monster theory.

2. Genus one extremal partition functions for $c = 8m$

The main purpose of this paper is to note that the arguments mentioned above may apply, with minor modifications, to the case where the central charge is a multiple of 8, $c = 8m$ with $m \in \mathbb{Z}$. In the Chern-Simons formulation this corresponds to taking a three-fold diagonal cover of $\mathrm{SO}(2,1) \times \mathrm{SO}(2,1)$ as the gauge group. Note that the resulting values of the Chern-Simons couplings, $k_{L,R} \in \frac{1}{3}\mathbb{Z}$, fit nicely with the last quantization condition in (1.3). In the cases $c = 8m$, holomorphic factorization is no longer possible in the strict sense, but one can still have holomorphic factorization up to a phase. This, along with the requirement that the primaries associated with black holes appear at the right level, uniquely specifies the partition function for each value of m. In what follows, we describe the construction of these partition functions, and we state exact and approximate formulas for the corresponding degeneracies of states.

2.1 Partition functions

The starting point of our construction is the well-known fact that, for a CFT of central charge $c = 8m$, there exists the possibility that the partition function factorizes as in (1.4), but with the holomorphic part picking up a phase under $T : \tau \to \tau + 1$,

$$
Z_{8m}(\tau) \to e^{-2\pi i m/3} Z_{8m}(\tau)\,, \qquad (2.1)
$$

and with the antiholomorphic part picking up the opposite phase so that the full partition function is modular invariant (see e.g. [14, 17]). Assuming that this is the case and furthermore assuming as in [10] that the theory is self-dual, the construction proceeds as follows. In the absence of primary fields, the partition function of such a theory would be just the vacuum Virasoro character,

$$Z_{0,8m}(\tau) = q^{-m/3} \prod_{n=2}^{\infty} \frac{1}{1-q^n} = q^{-m/3} \sum_{n=0}^{\infty} (P(n) - P(n-1))\, q^n \,, \tag{2.2}$$

where $P(n)$ denotes the number of partitions of n. This partition function clearly cannot account for the degeneracy of the BTZ black holes and, in addition, transforms non-trivially under $S : \tau \to -1/\tau$. To remedy these problems we would like to add primaries, to be identified with operators creating BTZ black holes, in such a way that modular invariance up to a phase is restored. To figure out the conformal weight of such states, we note that, choosing the additive constant in L_0 so that its eigenvalue is $h - \frac{c}{24}$ where h is the conformal weight, L_0 is related to the mass and angular momentum of a BTZ black hole according to

$$L_0 = \frac{1}{2}(\ell M + J)\,, \tag{2.3}$$

and the Bekenstein-Hawking entropy reads [18]

$$S_{BH}(m, L_0) = 4\pi \sqrt{\frac{c}{24} L_0} = 4\pi \sqrt{\frac{m}{3} L_0}\,, \tag{2.4}$$

with similar relations for the antiholomorphic sector. The minimal mass of a black hole corresponds to the case $\ell M = |J|$, i.e. $L_0 = 0$, for which the entropy vanishes. Therefore, the primaries associated with the black-hole states should appear for $L_0 > 0$, i.e. for $h \geqslant h_m$ where

$$h_m \equiv \left|\frac{m}{3}\right| + 1\,. \tag{2.5}$$

On the other hand, according to a result of Höhn [19], the dimension of the lowest primary in a self-dual CFT has an upper limit given by $h \leqslant h_m$. Therefore, our requirements can be satisfied only if $h = h_m$, that is, if the full partition function has the form

$$Z_{8m}(\tau) = q^{-m/3} \left(\prod_{n=2}^{\infty} \frac{1}{1-q^n} + \mathcal{O}(q^{[m/3]+1}) \right)\,. \tag{2.6}$$

Such partition functions are called extremal and have the remarkable property that they are uniquely determined once one imposes modular invariance up to a phase. Namely, the requirement (2.1) fixes a self-dual partition function with $c = 8m$ to be a weighted polynomial of weight $m/3$ generated by $j^{1/3}(\tau)$, with the general form [19]

$$Z_{8m}(\tau) = j^{m/3}(\tau) \sum_{r=0}^{[m/3]} a_r j^{-r}(\tau)\,. \tag{2.7}$$

The coefficients a_r are then determined by matching the terms of order $q^{r-m/3}$, $r = 0, \ldots, [m/3]$, with those in (2.6) as in [10] (see also [20]). The results of this analysis are given below.

For $c = 8$, 16, we have $h_m = 1$ meaning that the extra states enter at level one above the vacuum. Therefore there exists no mass gap and the extra states must correspond to massless fields arising as a result of a gauge symmetry. In fact, as the self-dual partition functions for $c = 8$ and $c = 16$ are well-known and believed to be unique, the result can be immediately anticipated. Indeed, applying the matching procedure we find

$$Z_8(\tau) = j^{1/3}(\tau) = q^{-1/3} + 248\, q^{2/3} + 4124\, q^{5/3} + 34752\, q^{8/3} + 213126\, q^{11/3} + \dots\,, \quad (2.8)$$

which is the vacuum character of the level 1 affine $\hat{E}_8$ theory (or $q^{-1/3}$ times the McKay-Thompson series of class 3C for the monster) and

$$\begin{aligned} Z_{16}(\tau) &= j^{2/3}(\tau) \\ &= q^{-2/3} + 496\, q^{1/3} + 69752\, q^{4/3} + 2115008\, q^{7/3} + 34670620\, q^{10/3} + \dots \end{aligned} \quad (2.9)$$

which is the vacuum character of the level 1 affine $\hat{E}_8 \times \hat{E}_8$ theory. Due to the presence of Kac-Moody symmetries, these extremal CFTs cannot be directly relevant to pure AdS_3 gravity but, possibly, to extensions of AdS_3 gravity including gauge fields with Chern-Simons interactions [10].

For $c = 24$, 32, 40, we have $h_m = 2$, i.e. the extra states enter at level two above the vacuum and the required mass gap exists. For $c = 24$ we find the partition function (1.5) discussed earlier on. For $c = 32$ and $c = 40$, we obtain the partition functions

$$\begin{aligned} Z_{32}(\tau) &= j^{4/3}(\tau) - 992\, j^{1/3}(\tau) \\ &= q^{-4/3} + 139504\, q^{2/3} + 69332992\, q^{5/3} + 6998296696\, q^{8/3} \\ &\quad +330022830080\, q^{11/3} + \dots , \end{aligned} \tag{2.10}$$

and

$$\begin{aligned} Z_{40}(\tau) &= j^{5/3}(\tau) - 1240\, j^{2/3}(\tau) \\ &= q^{-5/3} + 20620\, q^{1/3} + 86666240\, q^{4/3} + 24243884350\, q^{7/3} \\ &\quad +2347780456448\, q^{10/3} + \dots . \end{aligned} \tag{2.11}$$

These partition functions have been first obtained by Höhn in [19] and the corresponding CFTs have been identified with $\mathbb{Z}_2$ orbifolds of theories defined on even unimodular lattices of the respective rank possessing no vectors of squared length 2. Proceeding in this manner, we may in principle specify the partition function for any value of m. Explicit formulas up to $c = 88$ (omitting the cases $c = 48$, 72 already considered in [10]) are given below.

$$\begin{aligned} Z_{56}(\tau) &= j^{7/3}(\tau) - 1736\, j^{4/3}(\tau) + 401661\, j^{1/3}(\tau) \\ &= q^{-7/3} + q^{-1/3} + 7402776\, q^{2/3} + 33941442214\, q^{5/3} \\ &\quad +16987600857280\, q^{8/3} + 2998621352249926\, q^{11/3} \dots , \\ Z_{64}(\tau) &= j^{8/3}(\tau) - 1984\, j^{5/3}(\tau) + 705057\, j^{2/3}(\tau) \\ &= q^{-8/3} + q^{-2/3} + 278512\, q^{1/3} + 13996663144\, q^{4/3} + 19414403055040\, q^{7/3} \\ &\quad +769385603725340\, q^{10/3} + 1062805058989221728\, q^{13/3} + \dots , \\ Z_{80}(\tau) &= j^{10/3}(\tau) - 2480\, j^{7/3}(\tau) + 1496361\, j^{4/3}(\tau) - 132423391\, j^{1/3}(\tau) \\ &= q^{-10/3} + q^{-4/3} + q^{-1/3} + 173492852\, q^{2/3} + 4695630250012\, q^{5/3} \\ &\quad +8461738959649848\, q^{8/3} + 4293890043969667206\, q^{11/3} + \dots , \\ Z_{88}(\tau) &= j^{11/3}(\tau) - 2728\, j^{8/3}(\tau) + 1984269\, j^{5/3}(\tau) - 302198519\, j^{2/3}(\tau) \\ &= q^{-11/3} + q^{-5/3} + q^{-2/3} + 2365502\, q^{1/3} + 907649518712\, q^{4/3} \\ &\quad +4712143513485758\, q^{7/3} + 4723281033156413468\, q^{10/3} + \dots . \end{aligned} \tag{2.12}$$

These partition functions have not been, to our knowledge, previously identified in the literature. It would be interesting to examine whether corresponding CFTs actually exist.

2.2 Microstate counting

In what follows, we will verify that the partition functions constructed above can account for the degeneracy of the BTZ black hole states. According to Witten's interpretation, the new states appearing at each level are divided into primary states, corresponding to black holes, and Virasoro descendants of lower-lying primary states, corresponding to lower-mass black holes dressed with boundary excitations. Therefore, the number of microstates associated with black holes of a given mass is given by the number of primaries at the corresponding level. The total number of states $D(m, L_0)$ at a given eigenvalue $L_0 = h - \frac{m}{3}$ is read off from the relation

$$Z_{8m}(\tau) = \sum_{L_0+m/3=0}^{\infty} D(m, L_0) q^{L_0} , \qquad (2.13)$$

and the number $d(m, L_0)$ of primaries is then obtained by subtracting the number of descendants at this level. Once $d(m, L_0)$ is determined, we can define the microscopic entropy

$$S(m, L_0) = \ln d(m, L_0) . \qquad (2.14)$$

In practice, the contribution of descendant states to $D(m, L_0)$ is negligible and we can trade $d(m, L_0)$ for $D(m, L_0)$. In any case, the entropy computed by means of (2.14) turns out to be quite close to the semiclassical entropy (2.4), as explicitly shown on table 1 for $m = 3, \ldots, 8$ and for the first few values of L_0.

However, this agreement is a mild check of the proposed duality since it is mostly controlled by modular invariance[1] rather than by the detailed structure of the theory. To

m	L_0	d	S	S_{BH}
	1	196883	12.1904	12.5664
3	2	21296876	16.8741	17.7715
	3	842609326	20.5520	21.7656
	2/3	139503	11.8458	11.8477
4	5/3	69193488	18.0524	18.7328
	8/3	6928824200	22.6589	23.6954
	1/3	20619	9.9340	9.3664
5	4/3	86645620	18.2773	18.7328
	7/3	24157197490	23.9078	24.7812

m	L_0	d	S	S_{BH}
	1	42987519	17.5764	17.7715
6	2	40448921875	24.4233	25.1327
	3	8463511703277	29.7668	30.7812
	2/3	7402775	15.8174	15.6730
7	5/3	33934039437	24.2477	24.7812
	8/3	16953652012291	30.4615	31.3460
	1/3	278511	12.5372	11.8477
8	4/3	13996384631	23.3621	23.6954
	7/3	19400406113385	30.5963	31.3460

Table 1: Degeneracies, microscopic entropies and semiclassical entropies for the first few values of m and L_0.

see this, we recall that the Petersson-Rademacher formula [21, 22] completely determines the coefficients $F(l)$ of $q^{l-c/24}$ in the expansion of a modular form of weight w in terms of the corresponding polar coefficients $F(n)$, $n - \frac{c}{24} < 0$, according to [23]

$$F(l) = 2\pi \sum_{n-c/24<0} \left(\frac{\frac{c}{24} - n}{l - \frac{c}{24}}\right)^{(1-w)/2} F(n)$$
$$\times \sum_{k=1}^{\infty} \frac{1}{k} \mathrm{Kl}\left(l - \frac{c}{24}, n - \frac{c}{24}; k\right) I_{1-w}\left(\frac{4\pi}{k}\sqrt{\left(\frac{c}{24} - n\right)\left(l - \frac{c}{24}\right)}\right), \quad (2.15)$$

where $\mathrm{Kl}(a, b\,; k)$ is the Kloosterman sum

$$\mathrm{Kl}(a, b; k) = \sum_{d\in(\mathbb{Z}/k\mathbb{Z})^*} \exp\left(\frac{2\pi \mathrm{i}}{k}\left(d\, a + d^{-1} b\right)\right), \quad (2.16)$$

and $I_\nu(z)$ is a modified Bessel function of the first kind. Using this expression for the coefficients $D(m, L_0)$ of the partition function $Z_{8m}(\tau)$ and noting that for an extremal CFT the polar coefficients are the same as those in the vacuum character (2.2), namely $D\left(m, n - \frac{m}{3}\right) = P(n) - P(n-1)$ for $n = 0, \ldots, [m/3]$, we find

$$D(m, L_0) = 2\pi \sum_{n=0}^{[m/3]} \sqrt{\frac{\frac{m}{3} - n}{L_0}}\,(P(n) - P(n-1))$$
$$\times \sum_{k=1}^{\infty} \frac{1}{k} \mathrm{Kl}\left(L_0, n - \frac{m}{3}; k\right) I_1\left(\frac{4\pi}{k}\sqrt{\left(\frac{m}{3} - n\right) L_0}\right), \quad (2.17)$$

where we note that the $n - 1$ term vanishes since $P(1) = P(0)$. In this expression, the only factor that depends on the details of the theory is $P(n) - P(n-1)$.

Eq. (2.17) is an exact result, which can be used to derive various approximate expressions, appropriate for limiting cases. A first simplification is to use Weil's estimate $\mathrm{Kl}(a, b\,; k) \simeq \sqrt{k}$ to obtain the expression

$$D(m, L_0) \simeq 2\pi \sum_{n=0}^{[m/3]} \sqrt{\frac{\frac{m}{3} - n}{L_0}}\,(P(n) - P(n-1)) \sum_{k=1}^{\infty} \frac{1}{\sqrt{k}} I_1\left(\frac{4\pi}{k}\sqrt{\left(\frac{m}{3} - n\right) L_0}\right), \quad (2.18)$$

which turns out to be in excellent agreement with the actual number of microstates. The semiclassical results usually quoted in the literature are obtained by taking the large-m and large-L_0 limit, using the asymptotics $I_1(z) \simeq e^z/\sqrt{2\pi z}$, and keeping only the $n = 0$ and $k = 1$ terms in the two summations. Doing so, all information about the details of the theory (apart from the ground-state degeneracy) disappears, and one obtains the Hardy-Ramanujan formula

$$D(m, L_0) \simeq \frac{1}{\sqrt{2}} \frac{(m/3)^{1/4}}{L_0^{3/4}} \exp\left(4\pi\sqrt{\frac{m}{3}L_0}\right) , \tag{2.19}$$

which is valid for any CFT of central charge $c = 8m$ and leads to the entropy

$$S(m, L_0) \simeq S_{BH}(m, L_0) - \frac{3}{2}\ln S_{BH}(m, L_0) + \ln\frac{m}{3} + \ln\frac{4\sqrt{2}}{\pi} , \tag{2.20}$$

which is the Bekenstein-Hawking result plus the logarithmic corrections [24, 25]. Therefore, in the semiclassical limit one recovers the Bekenstein-Hawking entropy, as guaranteed by Cardy's formula [26], while the qualitative agreement for smaller values of m and L_0, as those shown on table 1, is due to the convergence properties of the sums in (2.18).

On the other hand, the exact formula (2.17) (or its approximation (2.18)) allows for a controlled expansion that makes it possible to determine the various corrections to the semiclassical results. In particular we note that the partition numbers $P(n)$, being the coefficients of $q^{n-1/24}$ in $\eta^{-1}(q)$, admit themselves the Petersson-Rademacher expansion

$$P(n) = 2\pi\left(\frac{\frac{1}{24}}{n-\frac{1}{24}}\right)^{3/4} \sum_{k=1}^{\infty} \frac{1}{k}\mathrm{Kl}\left(n - \frac{1}{24}, -\frac{1}{24}; k\right) I_{3/2}\left(\frac{4\pi}{k}\sqrt{\frac{1}{24}\left(n-\frac{1}{24}\right)}\right) . \tag{2.21}$$

Substituting (2.21) (or a suitable approximation thereof) in (2.18), and expanding around the semiclassical limit ($m, L_0 \to \infty$, L_0/m fixed), one may in principle calculate all leading and subleading corrections to the Bekenstein-Hawking formula in a systematic manner. It has been reported in [10] that a study of these corrections is in progress.

Note that with regard ln (13996663144), the value that we have used is that highlighted in yellow.

This makes us understand that Ramanujan already had in mind the mathematics of the monster theory and was aware that one day it would be used in an innovative way as in the case of physics applied to the study of entropies and microstates of black holes.

The complete formula is:

(((exp(0.5 * 0.7274076343383593606 8 * 0.66415110829800005170))))^2))) * 27^2+(ln (13996663144))^2

Input interpretation:

$$\exp^2(0.5 \times 0.72740763433835936068 \times 0.66415110829800005170) \times 27^2 + \log^2(13\,996\,663\,144)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1727.573225647597397810783318595741982715616943090249898511...

This result is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

Alternative representations:

$$\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.6641511082980000517000000)\, 27^2 + \log^2(13\,996\,663\,144) = 27^2 \exp^2(0.241554) + \log_e^2(13\,996\,663\,144)$$

Open code

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$$\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.6641511082980000517000000)\, 27^2 + \log^2(13\,996\,663\,144) = 27^2 \exp^2(0.241554) + (\log(a) \log_a(13\,996\,663\,144))^2$$

Series representations:

- More

$$\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.6641511082980000517000000)\, 27^2 + \log^2(13\,996\,663\,144) = 729 \exp^2(0.241554) + \left(\log(13\,996\,663\,143) - \sum_{k=1}^{\infty} \frac{\left(-\frac{1}{13\,996\,663\,143}\right)^k}{k}\right)^2$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.6641511082980000517000000)\, 27^2 + \log^2(13\,996\,663\,144) = 729 \exp^2(0.241554) + \left(2 i \pi \left\lfloor \frac{\arg(13\,996\,663\,144 - x)}{2 \pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (13\,996\,663\,144 - x)^k x^{-k}}{k}\right)^2 \quad \text{for } x < 0$$

Open code

$$\exp^2(0.5 \times 0.72740763433835936068000 \times 0.66415110829800005170000)\, 27^2 + \log^2(13\,996\,663\,144) = 729 \exp^2(0.241554) + \left(\log(z_0) + \left\lfloor \frac{\arg(13\,996\,663\,144 - z_0)}{2\pi} \right\rfloor \left(\log\left(\frac{1}{z_0}\right) + \log(z_0)\right) - \sum_{k=1}^{\infty} \frac{(-1)^k (13\,996\,663\,144 - z_0)^k z_0^{-k}}{k}\right)^2$$

Open code

- $\arg(z)$ is the complex argument
- $\lfloor x \rfloor$ is the floor function
- i is the imaginary unit

Integral representations:

$$\exp^2(0.5 \times 0.72740763433835936068000 \times 0.66415110829800005170000)\, 27^2 + \log^2(13\,996\,663\,144) = 729 \exp^2(0.241554) + \left(\int_1^{13\,996\,663\,144} \frac{1}{t}\, dt\right)^2$$

Open code

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$$\exp^2(0.5 \times 0.72740763433835936068000 \times 0.66415110829800005170000)\, 27^2 + \log^2(13\,996\,663\,144) = 729 \exp^2(0.241554) + \frac{\left(\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{13\,996\,663\,143^{-s}\, \Gamma(-s)^2\, \Gamma(1+s)}{\Gamma(1-s)}\, ds\right)^2}{4 i^2 \pi^2} \quad \text{for } -1 < \gamma < 0$$

Open code

- $\Gamma(x)$ is the gamma function
-

Note that:

((((((((((((exp(0.5 * 0.72740763433835936068 * 0.66415110829800005170))))^2))) * 27^2+(ln (13996663144))^2))))))))))^1/15

Input interpretation:

$$\left(\exp^2(0.5 \times 0.72740763433835936068 \times 0.66415110829800005170) \times 27^2 + \log^2(13\,996\,663\,144)\right) \wedge (1/15)$$

Open code

- $\log(x)$ is the natural logarithm

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Result:

- Fewer digits
- More digits

1.643724761925081379178259460785290620493426134467171271991...

1.643724761925081379178259460785290620493426134467171 2

This value 1,643724 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{249+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{117+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{1752848168\,\pi}{3350156337} \approx 1.64372476192508137913148 1$$

$$\frac{-797-261\,e+574\,e^2}{3(276+59\,e+16\,e^2)} \approx 1.6437247619250813794630 1$$

root of $28309\,x^3-62583\,x^2+7125\,x+31655$ near $x=1.64372$ ≈ 1.64372476192508137919576 6

And that:

[((((((((exp(0.5 * 0.72740763433835936068 * 0.66415110829800005170))))^2))) * 27^2+(ln (13996663144))^2))))))^1/15))))]^10 * sqrt(27) - sqrt(16)

Input interpretation:

$$\left(\exp^2(0.5\times 0.72740763433835936068\times 0.66415110829800005170)\times 27^2+\log^2(13996663144)\right)\,\hat{}\,(1/15)^{10}\sqrt{27}-\sqrt{16}$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

744.1227446543736282587233230283077078736238041407019814899...

Alternative representations:

$$\left(\exp^2(0.5\times 0.727407634338359360680000\times 0.664151108298000051700000)\,27^2+\log^2(13996663144)\right)^\wedge(1/15)^{10}\sqrt{27}-\sqrt{16}=-\sqrt{16}+\sqrt[15]{27^2\exp^2(0.241554)+\log_e^2(13996663144)}^{10}\sqrt{27}$$

Open code

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$$\left(\exp^2(0.5\times 0.727407634338359360680000\times 0.664151108298000051700000)\,27^2+\log^2(13996663144)\right)^\wedge(1/15)^{10}\sqrt{27}-\sqrt{16}=-\sqrt{16}+\sqrt[15]{27^2\exp^2(0.241554)+(\log(a)\log_a(13996663144))^2}^{10}\sqrt{27}$$

Series representations:

$$\left(\exp^2(0.5\times 0.727407634338359360680000\times 0.664151108298000051700000)\,27^2+\log^2(13996663144)\right)^\wedge(1/15)^{10}\sqrt{27}-\sqrt{16}=-\sqrt{x}\left(\exp\left(i\pi\left\lfloor\frac{\arg(16-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(16-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}-\exp\left(i\pi\left\lfloor\frac{\arg(27-x)}{2\pi}\right\rfloor\right)\left(729\exp^2(0.241554)+\left(\log(13996663143)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{13996663143}\right)^k}{k}\right)^2\right)^{2/3}\sum_{k=0}^{\infty}\frac{(-1)^k(27-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\quad\text{for }(x\in\mathbb{R}\text{ and }x<0)$$

Open code

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$$(\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.664151108298000051700000)\, 27^2 + \log^2(13\,996\,663\,144))\ \hat{}\ (1/15)^{10} \sqrt{27} - \sqrt{16} = -\sqrt{z_0}\left(\left(\frac{1}{z_0}\right)^{1/2 \lfloor \arg(16-z_0)/(2\pi)\rfloor} z_0^{1/2 \lfloor \arg(16-z_0)/(2\pi)\rfloor} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (16-z_0)^k z_0^{-k}}{k!} - \left(\frac{1}{z_0}\right)^{1/2 \lfloor \arg(27-z_0)/(2\pi)\rfloor} z_0^{1/2 \lfloor \arg(27-z_0)/(2\pi)\rfloor} \left(729 \exp^2(0.241554) + \left(\log(13\,996\,663\,143) - \sum_{k=1}^{\infty} \frac{\left(-\frac{1}{13\,996\,663\,143}\right)^k}{k}\right)^2\right)^{2/3} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (27-z_0)^k z_0^{-k}}{k!}\right)$$

- $\arg(z)$ is the complex argument
- $\lfloor x \rfloor$ is the floor function
- $n!$ is the factorial function
- $(a)_n$ is the Pochhammer symbol (rising factorial)
- i is the imaginary unit
- $\mathbb{R}$ is the set of real numbers

Integral representations:

$$(\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.664151108298000051700000)\, 27^2 + \log^2(13\,996\,663\,144))\ \hat{}\ (1/15)^{10} \sqrt{27} - \sqrt{16} = -\sqrt{16} + \left(729 \exp^2(0.241554) + \left(\int_1^{13\,996\,663\,144} \frac{1}{t}\, dt\right)^2\right)^{2/3} \sqrt{27}$$

Open code

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$$(\exp^2(0.5 \times 0.7274076343383593606800000 \times 0.664151108298000051700000)\, 27^2 + \log^2(13\,996\,663\,144))\ \hat{}\ (1/15)^{10} \sqrt{27} - \sqrt{16} = -\sqrt{16} + \left(729 \exp^2(0.241554) + \frac{\left(\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{13\,996\,663\,143^{-s}\, \Gamma(-s)^2\, \Gamma(1+s)}{\Gamma(1-s)}\, ds\right)^2}{4 i^2 \pi^2}\right)^{2/3} \sqrt{27}$$

for $-1 < \gamma < 0$

Open code

- $\Gamma(x)$ is the gamma function

Where 744.1227... ≈ 744 that is a number of the Laurent series in terms of q.

We remember that several remarkable properties of j have to do with its q-expansion (Fourier series expansion), written as a Laurent series in terms of $q = \exp(2\pi i\tau)$ (the square of the nome), which begins:

$$j(\tau) = \frac{1}{q} + 744 + 196884q + 21493760q^2 + 864299970q^3 + 20245856256q^4 + \cdots$$

We note that:

From:

Modular equations and approximations to π (S. Ramanujan)
Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

We have that:

$$64(g_{22}^{24} + g_{22}^{-24}) = e^{\pi\sqrt{22}} - 24 + 4372e^{-\pi\sqrt{22}} + \cdots = 64\{(1+\sqrt{2})^{12} + (1-\sqrt{2})^{12}\}.$$

Hence

$$e^{\pi\sqrt{22}} = 2508951.9982\ldots.$$

$$64(G_{37}^{24} + G_{37}^{-24}) = e^{\pi\sqrt{37}} + 24 + 4372e^{-\pi\sqrt{37}} - \cdots = 64\{(6+\sqrt{37})^{6} + (6-\sqrt{37})^{6}\}.$$

Hence

$$e^{\pi\sqrt{37}} = 199148647.999978\ldots.$$

$$64(g_{58}^{24} + g_{58}^{-24}) = e^{\pi\sqrt{58}} - 24 + 4372e^{-\pi\sqrt{58}} + \cdots = 64\left\{\left(\frac{5+\sqrt{29}}{2}\right)^{12} + \left(\frac{5-\sqrt{29}}{2}\right)^{12}\right\}.$$

Hence

$$e^{\pi\sqrt{58}} = 24591257751.99999982\ldots.$$

Now, from the three values 24591257752, 199148648 and 2508952 , we obtain:

(24591257752 – 199148648 – 2508952)^1/47

Input:

$$\sqrt[47]{24591257752 - 199148648 - 2508952}$$

Open code

Result:

- Approximate form
- Step-by-step solution

$$2^{3/47}\sqrt[47]{3048700019}$$

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Decimal approximation:

- More digits

  1.663429330383565109589777083813405500763471728495377583846...

  Open code

Alternate form:

root of $x^{47} - 24\,389\,600\,152$ near $x = 1.66343$

1.663429330383565109589777083813405500763471728495377583846

This value 1,663429 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{33+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{16+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{496+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{11+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

  Open code

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Possible closed forms:

- More

  π root of $560x^5 - 82x^4 + 31x^3 - 680x^2 + 40x + 148$ near $x = 0.529486$ $\approx$ 1.66342933038356510973511

  $\frac{2(-39 - 12\pi + 322\pi^2)}{-160 + 1219\pi + 6\pi^2} \approx 1.66342933038356510946117$

  root of $73x^5 - 100x^4 + 23x^3 - 174x^2 - 881x + 1677$ near $x = 1.66343$ $\approx$ 1.66342933038356510977190

and

1.66342933038 ≈ 1,663;

Input:

1.663^{13}

Open code

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Result:

744.04506388764547008651126895505808194470 3

Open code

744.045063887645470086511268955058081944703

Possible closed forms:

- More

$$\frac{10373\, e\, e! + 4791 - 555\, e - 8492\, e^2}{30\, e} \approx 744.04506388764547008 19983$$

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$$\frac{12995\, \pi\, \pi! - 187 + 15724\, \pi + 1280\, \pi^2}{152\, \pi} \approx 744.04506388764547008692589$$

root of $x^5 - 753\, x^4 + 6659\, x^3 + 2882\, x^2 + 1436\, x - 1397$ near $x = 744.045$ ≈

744.04506388764547009 7274

- $n!$ is the factorial function

where:

744.0450638... ≈ 744 (see pag. 53)

Now, we have that (From Wikipedia):

Ramanujan's master theorem (named after Srinivasa Ramanujan) is a technique that provides an analytic expression for the Mellin transform of an analytic function. It was widely used by Ramanujan to calculate definite integrals and infinite series. An alternative formulation of Ramanujan's master theorem is as follows:

$$\int_0^\infty x^{s-1}(\lambda(0) - x\lambda(1) + x^2\lambda(2) - \cdots)\, dx = \frac{\pi}{\sin(\pi s)}\lambda(-s)$$

which gets converted to the above form after substituting

$$\lambda(n) = \frac{\varphi(n)}{\Gamma(1+n)}$$

and using the functional equation for the gamma function.

The integral above is convergent for $0 < \mathrm{Re}(s) < 1$ subject to growth conditions on φ . A proof subject to "natural" assumptions (though not the weakest necessary conditions) to Ramanujan's Master theorem was provided by G. H. Hardy employing the residue theorem and the well-known Mellin inversion theorem.

From pag. 198 of:

RAMANUJAN

TWELVE LECTURES ON
SUBJECTS SUGGESTED BY HIS LIFE AND WORK

BY

G. H. HARDY

Sadleirian Professor of Pure Mathematics in the University of Cambridge

CAMBRIDGE
AT THE UNIVERSITY PRESS
1940

11.8. I quote a few of Ramanujan's special cases.

(i) If $0 < s < \operatorname{Min}(\alpha, \beta)$, then

$$\int_0^\infty x^{s-1} F(\alpha, \beta, \gamma, -x)\, dx = \frac{\Gamma(\gamma)}{\Gamma(\alpha)\Gamma(\beta)} \frac{\Gamma(s)\Gamma(\alpha - s)\Gamma(\beta - s)}{\Gamma(\gamma - s)}.$$

Here $F(\alpha, \beta, \gamma, x)$ is the hypergeometric function, defined for $0 < x < 1$ by the usual power-series and for $x > 1$ by analytic continuation.

(ii) If $0 < s < 1$, then

$$\int_0^\infty x^{s-1}(1^{-a} - 2^{-a}x + 3^{-a}x^2 - \dots)\, dx = \frac{\pi}{\sin s\pi}(1-s)^{-a}.$$

(iii) If $0 < q < 1$, $s > 0$, and $0 < a < q^{s-1}$, then

$$\int_0^\infty x^{s-1} \frac{(1+aqx)(1+aq^2x)\dots}{(1+x)(1+qx)(1+q^2x)\dots}\, dx = \frac{\pi}{\sin s\pi} \prod_1^\infty \frac{(1-q^{m-s})(1-aq^m)}{(1-q^m)(1-aq^{m-s})}.$$

(iv) If $0 < s < \frac{1}{2}$, then

$$\int_0^\infty x^{s-1} \sum_0^\infty \frac{(-1)^n x^n}{n!\,\zeta(2n+2)}\, dx = \frac{\Gamma(s)}{\zeta(2-2s)}.$$

Of these, (i) and (ii) are straightforward corollaries of what we have proved. To prove (iii), we use the expansion

$$\Phi(x) = \frac{(1+aqx)(1+aq^2x)\dots}{(1+x)(1+qx)(1+q^2x)\dots} = \sum_0^\infty (-1)^n \frac{(1-aq)(1-aq^2)\dots(1-aq^n)}{(1-q)(1-q^2)\dots(1-q^n)} x^n,$$

which is easily deduced from the functional equation

$$(1+aqx)\Phi(qx) = (1+x)\Phi(x)$$

satisfied by $\Phi(x)$. Here

$$\phi(u) = \prod_{m=1}^\infty \frac{(1-aq^m)(1-q^{m+u})}{(1-q^m)(1-aq^{m+u})}.$$

Finally (iv) is a formula found independently by M. Riesz, and used by him to determine a very curious necessary and sufficient condition for the truth of the Riemann hypothesis. On this hypothesis, the formula is true for $0 < s < \frac{3}{4}$. An alternative form of $\Phi(x)$ is

$$\Phi(x) = \sum_1^\infty \frac{\mu(m)}{m} e^{-x/m^2},$$

where $\mu(m)$ is the Möbius function.

We take

(iii) If $0 < q < 1$, $s > 0$, and $0 < a < q^{s-1}$, then

$$\int_0^\infty x^{s-1} \frac{(1+aqx)(1+aq^2x)\dots}{(1+x)(1+qx)(1+q^2x)\dots} dx = \frac{\pi}{\sin s\pi} \prod_1^\infty \frac{(1-q^{m-s})(1-aq^m)}{(1-q^m)(1-aq^{m-s})}.$$

With a = 1.2 ; q = 0.5 = 1/2 ; m = 2 ; and s = 0.625 = 5/8 , we obtain:

Pi/(sin0.625*Pi) * [(((1-0.5^1.375)(1-1.2*0.5^2)))/(((1-0.5^2)(1-1.2*0.5^1.375)))]

Input:

$$\frac{\pi}{\sin(0.625)\pi} \times \frac{(1-0.5^{1.375})(1-1.2\times 0.5^2)}{(1-0.5^2)(1-1.2\times 0.5^{1.375})}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.824092225137542357761741865167807325687964588509059637910...

Alternative representations:

- More

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{\pi(1-0.5^{1.375})(1-1.2\times 0.5^2)}{\frac{((1-1.2\times 0.5^{1.375})(1-0.5^2))\pi}{\csc(0.625)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{\pi(1-0.5^{1.375})(1-1.2\times 0.5^2)}{\left(\pi\cos\left(-0.625+\frac{\pi}{2}\right)\right)((1-1.2\times 0.5^{1.375})(1-0.5^2))}$$

Open code

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = -\frac{\pi(1-0.5^{1.375})(1-1.2\times 0.5^2)}{\left(\pi\cos\left(0.625+\frac{\pi}{2}\right)\right)((1-1.2\times 0.5^{1.375})(1-0.5^2))}$$

Series representations:

- More

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{0.533636}{\sum_{k=0}^{\infty}(-1)^k J_{1+2k}(0.625)}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{1.06727}{\sum_{k=0}^{\infty}\frac{(-1)^k 0.625^{1+2k}}{(1+2k)!}}$$

Open code

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{1.06727}{\sum_{k=0}^{\infty}\frac{(-1)^k \left(0.625-\frac{\pi}{2}\right)^{2k}}{(2k)!}}$$

Open code

- $J_n(z)$ is the Bessel function of the first kind
- $n!$ is the factorial function

Integral representations:

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{1.70763}{\int_0^1 \cos(0.625\,t)\,dt}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{6.83054\,i\,\pi}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-0.0976563/s+s}}{s^{3/2}}\,ds} \quad \text{for } \gamma > 0$$

Open code

$$\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)} = \frac{6.83054\,i\,\pi}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{2.3263\,s}\,\Gamma(s)}{\Gamma\left(\frac{3}{2}-s\right)}\,ds} \quad \text{for } 0 < \gamma < 1$$

Open code

- i is the imaginary unit
- $\Gamma(x)$ is the gamma function

1.8240922251375423577617418651678073256879645885090596

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{19+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\sqrt{\frac{1}{149}(-713+969\,e-485\,\pi+142\log(2))} \approx 1.8240922251375423568227$$

$$\frac{2422511509\,\pi}{4172236609} \approx 1.82409222513754235770 5278$$

root of $8031\,x^3-2625\,x^2-11537\,x-18964$ near $x = 1.82409$ $\approx$

1.82409222513754235778 1353

And:

(((((((Pi/(sin0.625*Pi)*[(((1-0.5^1.375)(1-1.2*0.5^2)))/(((1-0.5^2)(1-1.2*0.5^1.375)))])))))^11

Input:

$$\left(\frac{\pi}{\sin(0.625)\,\pi}\times\frac{(1-0.5^{1.375})(1-1.2\times0.5^2)}{(1-0.5^2)(1-1.2\times0.5^{1.375})}\right)^{11}$$

Open code

- Units »

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

743.900267219816685893896075392769616739673693822364619925 4...

743.9002672198166858938960753927696167396736938223646 1

Continued fraction:

- Linear form

$$743+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{37+\cfrac{1}{3+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{7+\cfrac{1}{6+\cfrac{1}{4+\cfrac{1}{7+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Possible closed forms:

- More

$$\frac{57900-193687\pi+76150\pi^2}{86\pi}\approx 743.900267219816685\,94147$$

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{56}\left(1560e^{\pi}+2570\pi-3516\log(\pi)+375\log(2\pi)+650\tan^{-1}(\pi)\right)\approx$$

743.90026721981666858941452

$$-\tan\left(\csc\left(\frac{488293011}{3825292639}\right)\right)\approx 743.900267219816685\,95598$$

- $\tan^{-1}(x)$ is the inverse tangent function

- $\log(x)$ is the natural logarithm
- $\csc(x)$ is the cosecant function

Where 743,9002672... ≈ 744 (see pag. 53)

We have also that:

ln(((((Pi/(sin0.625*Pi)*[(((1-0.5^1.375)(1-1.2*0.5^2)))/(((1-0.5^2)(1-1.2*0.5^1.375)))]))))))

Input:

$$\log\left(\frac{\pi}{\sin(0.625)\,\pi}\times\frac{(1-0.5^{1.375})(1-1.2\times0.5^2)}{(1-0.5^2)(1-1.2\times0.5^{1.375})}\right)$$

Open code

- $\log(x)$ is the natural logarithm

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

0.601082452401084817407801431494369140831890233052787664768...

0.6010824524010848174078014314943691408318902330527876

Alternative representations:

- More

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times0.5^2))\,\pi}{((1-0.5^2)(1-1.2\times0.5^{1.375}))(\sin(0.625)\,\pi)}\right)=\log_e\left(\frac{\pi(1-0.5^{1.375})(1-1.2\times0.5^2)}{((1-1.2\times0.5^{1.375})(1-0.5^2))(\pi\sin(0.625))}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times0.5^2))\,\pi}{((1-0.5^2)(1-1.2\times0.5^{1.375}))(\sin(0.625)\,\pi)}\right)=\log(a)\log_a\left(\frac{\pi(1-0.5^{1.375})(1-1.2\times0.5^2)}{((1-1.2\times0.5^{1.375})(1-0.5^2))(\pi\sin(0.625))}\right)$$

Open code

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times0.5^2))\,\pi}{((1-0.5^2)(1-1.2\times0.5^{1.375}))(\sin(0.625)\,\pi)}\right)=\log\left(\frac{\pi(1-0.5^{1.375})(1-1.2\times0.5^2)}{\left(\pi\cos\left(-0.625+\frac{\pi}{2}\right)\right)((1-1.2\times0.5^{1.375})(1-0.5^2))}\right)$$

Series representations:

- More

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right) = -\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{1.06727}{\sin(0.625)}\right)^k}{k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right) = \log\left(\frac{0.533636}{\sum_{k=0}^{\infty}(-1)^k J_{1+2k}(0.625)}\right)$$

Open code

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right) = \log\left(\frac{1.06727}{\sum_{k=0}^{\infty}\frac{(-1)^k\, 0.625^{1+2k}}{(1+2k)!}}\right)$$

Integral representations:

- More

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right) = \int_1^{\frac{1.06727}{\sin(0.625)}}\frac{1}{t}\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right) = \log\left(\frac{1.70763}{\int_0^1\cos(0.625\,t)\,dt}\right)$$

Open code

$$\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right) =$$
$$\log\left(\frac{6.83054\,i\,\pi}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-0.0976563/s+s}}{s^{3/2}}\,ds}\right) \quad \text{for } \gamma > 0$$

1/ln(((((Pi/(sin0.625*Pi)*[(((1-0.5^1.375)(1-1.2*0.5^2)))/(((1-0.5^2)(1-1.2*0.5^1.375)))]))))))

Input:

$$\frac{1}{\log\left(\frac{\pi}{\sin(0.625)\pi}\times\frac{(1-0.5^{1.375})(1-1.2\times 0.5^2)}{(1-0.5^2)(1-1.2\times 0.5^{1.375})}\right)}$$

Open code

- $\log(x)$ is the natural logarithm
  - Units »

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.66366526922454412171954890260954562043351103574229442968...

1.663665269224544121719548902609545620433511035742294 4

This value 1,66366 is very near to the golden ratio. It can be defined a golden number.

Alternative representations:

- More

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log_e\left(\frac{\pi(1-0.5^{1.375})(1-1.2\times 0.5^2)}{((1-1.2\times 0.5^{1.375})(1-0.5^2))(\pi\sin(0.625))}\right)}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log(a)\log_a\left(\frac{\pi(1-0.5^{1.375})(1-1.2\times 0.5^2)}{((1-1.2\times 0.5^{1.375})(1-0.5^2))(\pi\sin(0.625))}\right)}$$

Open code

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log\left(\frac{\pi(1-0.5^{1.375})(1-1.2\times 0.5^2)}{\left(\pi\cos\left(-0.625+\frac{\pi}{2}\right)\right)((1-1.2\times 0.5^{1.375})(1-0.5^2))}\right)}$$

Series representations:

- More

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = -\frac{1}{\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{1.06727}{\sin(0.625)}\right)^k}{k}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log\left(\frac{0.533636}{\sum_{k=0}^{\infty}(-1)^k J_{1+2k}(0.625)}\right)}$$

Open code

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log\left(\frac{1.06727}{\sum_{k=0}^{\infty}\frac{(-1)^k 0.625^{1+2k}}{(1+2k)!}}\right)}$$

Integral representations:

- More

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\frac{1.06727}{\int_1^{\sin(0.625)} \frac{1}{t}\,dt}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log\left(\frac{1.70763}{\int_0^1 \cos(0.625\,t)\,dt}\right)}$$

Open code

$$\frac{1}{\log\left(\frac{((1-0.5^{1.375})(1-1.2\times 0.5^2))\pi}{((1-0.5^2)(1-1.2\times 0.5^{1.375}))(\sin(0.625)\pi)}\right)} = \frac{1}{\log\left(\frac{6.83054\,i\,\pi}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{e^{-0.0976563/s+s}}{s^{3/2}}\,ds}\right)} \quad \text{for } \gamma > 0$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{36+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{17+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{8331+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\cot\left(\sin\left(\frac{14\,352\,431}{1\,621\,213}\right)\right) \approx 1.66366526922454409025$$

$$\frac{3\,(-53+62\,\pi+44\,\pi^2)}{2\,(-559+271\,\pi+23\,\pi^2)} \approx 1.66366526922454412163972$$

$$\frac{1128468619\,\pi}{2130950732} \approx 1.66366526922454412160641$$

Note that:

1.663665269224544121719548…. ≈ 1.663;

Input:

1.663^{13}

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

744.045063887645470086511268955058081944703

Note that:

744.045063887… ≅ 744

The value is part of this expression:

$$Z_{24}(\tau) = j(\tau) - 744$$
$$= q^{-1} + 196884\,q + 21493760\,q^2 + 864299970\,q^3 + 20245856256\,q^4 + \ldots, \quad (1.5)$$

From Wikipedia:

The q-expansion and moonshine

Several remarkable properties of j have to do with its q-expansion (Fourier series expansion), written as a Laurent series in terms of $q = \exp(2\pi i\tau)$ (the square of the nome), which begins:

$$j(\tau) = \frac{1}{q} + 744 + 196884q + 21493760q^2 + 864299970q^3 + 20245856256q^4 + \cdots$$

Note that j has a simple pole at the cusp, so its q-expansion has no terms below q^{-1}.

All the Fourier coefficients are integers, which results in several almost integers, notably Ramanujan's constant:

$$e^{\pi\sqrt{163}} \approx 640320^3 + 744.$$

The asymptotic formula for the coefficient of q^n is given by

$$\frac{e^{4\pi\sqrt{n}}}{\sqrt{2}n^{3/4}},$$

as can be proved by Hardy–Littlewood circle method.[2][3]

We have that:

$e^{\pi\sqrt{163}} \approx 640320^3 + 744$

640320^3 + 744 = 262537412640768744;

Input:

262 537 412 640 768 744

Open code

Prime factorization:

- Step-by-step solution

  $2^3 \times 3 \times 10939058860032031$

10939058860032031 * 24

10939058860032031

10 939 058 860 032 031 is a prime number.

10 939 058 860 032 031 has the representation

$10\,939\,058\,860\,032\,031 = 2^{15} \times 3^2 \times 3335^3 + 31.$

10939058860032031 – 31

Result:

10 939 058 860 032 000

10939058860032000

$2^{15} \times 3^2 \times 5^3 \times 23^3 \times 29^3$

((10939058860032000/4096)/8))/125

Input:

$$\frac{\frac{\frac{10\,939\,058\,860\,032\,000}{4096}}{8}}{125}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Exact result:

- Step-by-step solution

  2 670 668 667

Scientific notation:

2.670668667×10^9

2670668667

$3^2 \times 23^3 \times 29^3$

((((((sqrt(sqrt(sqrt(sqrt(sqrt(sqrt(sqrt(2.670668667 × 10^9))))))^3

Input interpretation:

$$\sqrt{\left(\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{2.670668667\times 10^9}}}}}}\right)^3}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.663169095657893915789620672677514240677986049693564305452...

1.6631690956578939157896206726775142406779860496935643

This value 1,663169 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{31+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{80+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{16+\cfrac{1}{6+\cfrac{1}{12+\cfrac{1}{5+\cfrac{1}{94+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\log\left(\frac{1}{243}\left(-6\left(86+\sqrt{2}\right)+e+8e^2+37\pi+165\pi^2\right)\right)\approx 1.663169095657893915796127$$

$$\frac{4584\,e\,e!+6949-650\,e-4705\,e^2}{5200\,e}\approx 1.663169095657893915790480$$

$$\frac{3907187507\,\pi}{7380362947} \approx 1.66316909565789391577 3883$$

•

Or:

(((((((2.670668667 × 10^9)^1/128)))))^3

Input interpretation:

$$\left(\sqrt[128]{2.670668667 \times 10^9}\right)^3$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.663169095657893915789620672677514240677986049693564305452...

(1.663)^13

Input:

$$1.663^{13}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

744.0450638876454700865112689550580819447 03

With regard the number 2670668667 that is equal to:

$$3^2 \times 23^3 \times 29^3$$

we have that:

(3^2 + 23^3 + 29^3)/21 – 13

Input:

$$\frac{1}{21}\left(3^2 + 23^3 + 29^3\right) - 13$$

Open code

Enlarge Data Customize A Plaintext Interactive

Exact result:

- Step-by-step solution

$$\frac{36292}{21}$$

Decimal approximation:

- More digits

1728.190476190476190476190476190476190476190476190476190476...

This result 1728,19047... is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

And:

(((3^2 + 23^3 + 29^3)/21 - 13))^1/3

Input:

$$\sqrt[3]{\frac{1}{21}\left(3^2+23^3+29^3\right)-13}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$$2^{2/3}\sqrt[3]{\frac{9073}{21}}$$

Decimal approximation:

- More digits

12.000440900907917825132712243370521428456976230772025042\63...

12.00044090090791782513271224337052142845697623077202504263

Continued fraction:

- Linear form

$$12+\cfrac{1}{2268+\cfrac{1}{12+\cfrac{1}{3402+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{161+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{8+\cfrac{1}{4536+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{9518908977\pi}{2491952984} \approx 12.000440900907917824976 0$$

root of $287x^4 - 3339x^3 - 1513x^2 + 3011x + 76$ near $x = 12.0004$ $\approx$ 12.00044090090791783229 1

π root of $68x^4 - 354x^3 - 2004x^2 + 7371x + 6338$ near $x = 3.81986$ $\approx$ 12.000440900907917825711 27

This result 12,00044 is very near to the value of black hole entropy 12,1904

2 * (((3^2 + 23^3 + 29^3)/21 - 13))^1/3

Input:

$$2\sqrt[3]{\frac{1}{21}(3^2+23^3+29^3)-13}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$$2\times 2^{2/3}\sqrt[3]{\frac{9073}{21}}$$

Decimal approximation:

- More digits

24.000881801815835650265424486741042856913952461544050085 26…

24.00088180181583565026542448674104285691395246154405008526

Continued fraction:

- Linear form

$$24+\cfrac{1}{1134+\cfrac{1}{24+\cfrac{1}{1701+\cfrac{1}{19+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{80+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{16+\cfrac{1}{2268+\cfrac{1}{15+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

π root of $6x^4 + 77x^3 - 11x^2 - 7339x + 1937$ near $x = 7.63972$ $\approx$
24.000881801815835648779

π root of $748x^3 + 7232x^2 - 88498x - 79527$ near $x = 7.63972$ $\approx$
24.000881801815835647680

$$\frac{9518908977\pi}{1245976492} \approx 24.000881801815835649952$$

This value 24,00088 is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

(((3^2 + 23^3 + 29^3)/21 - 13))^1/15

Input:

$$\sqrt[15]{\frac{1}{21}(3^2 + 23^3 + 29^3) - 13}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}$$

Decimal approximation:

- More digits

1.6437639082009440749934869573517057081358759622320943762 29...

Open code

Alternate forms:

- Step-by-step solution

$$\frac{1}{21}\times 2^{2/15}\sqrt[15]{9073}\ 21^{14/15}$$

Open code

root of $21x^{15} - 36292$ near $x = 1.64376$

All 15th roots of 36292/21:

- Fewer roots
- More roots
- More digits
- Polar form

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\ e^0 \approx 1.64376 \text{ (real, principal root)}$$

Open code

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\ e^{(2i\pi)/15} \approx 1.50165 + 0.6686\,i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\ e^{(4i\pi)/15} \approx 1.0999 + 1.2216\,i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{(2 i \pi)/5} \approx 0.5080 + 1.5633\, i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{(8 i \pi)/15} \approx -0.17182 + 1.63476\, i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{(2 i \pi)/3} \approx -0.8219 + 1.4235\, i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{(4 i \pi)/5} \approx -1.3298 + 0.9662\, i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{(14 i \pi)/15} \approx -1.6078 + 0.34176\, i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{-(14 i \pi)/15} \approx -1.6078 - 0.3418\, i$$

$$2^{2/15}\sqrt[15]{\frac{9073}{21}}\, e^{-(4 i \pi)/5} \approx -1.3298 - 0.9662\, i$$

1.643763908200944074993486957351705708135875962232094376229

This value 1,643763 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1324+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{15+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$-\csc\left(\sin\left(\frac{104786603}{27185929}\right)\right) \approx 1.643763908200944074929356$$

$$\log\left(\frac{1}{54}\left(-246+26\sqrt{2}+452e+e^2+359\pi-190\pi^2\right)\right)\approx$$
1.643763908200944074980696

$$\frac{1632684491\,\pi}{3120417462}\approx 1.6437639082009440749\,42054$$

•

For the number 2670668667, we have that:

(2670668667)^1/43

Input:

$$\sqrt[43]{2670668667}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$3^{2/43}\times 667^{3/43}$$

Decimal approximation:

- More digits

1.656623131700938356588250784144015045800286513181051496304...

1.656623131700938356588250784144015045800286513181051496304

This value 1,65662 is very near to the golden ratio. It can be defined a golden number. It is also very near to the 14th root of the following Ramanujan's class invariant $Q = (G_{505}/G_{101/5})^3 = 1164{,}2696$ i.e. 1,65578...

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{10+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{10+\cfrac{1}{6+\cfrac{1}{3+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{3+\cfrac{1}{10+\cfrac{1}{5+\cfrac{1}{4+\cfrac{1}{11+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{2}{5}\pi\cos^{-1}\left(\frac{487210}{1187867}\right)^2 \approx 1.65662313170093829622$$

$$\text{root of } 2333x^3+11030x^2-23474x-1990 \text{ near } x=1.65662 \approx 1.65662313170093835657428$$

$$\frac{1}{\text{root of } 1990x^3+23474x^2-11030x-2333 \text{ near } x=0.603638} \approx 1.65662313170093835657428$$

While:

(2670668667)^1/45

Input:

$$\sqrt[45]{2670668667}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$3^{2/45}\sqrt[15]{667}$$

Decimal approximation:

- More digits

1.619871053099393107829166190319121918263762592689885929418...

1.619871053099393107829166190319121918263762592689885929418

This value 1,61987 is a very good approximation to the golden ratio.

Continued fraction:

Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{32+\cfrac{1}{2+\cfrac{1}{8+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{\ddots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

More

$\log\left(\frac{1}{12}\left(356-20\sqrt{2}-17e+21e^2-82\pi-12\pi^2\right)\right)\approx 1.61987105309939310748633$

root of $3x^5+723x^4-780x^3-208x^2-691x-31$ near $x=1.61987$ $\approx$ $1.61987105309939310782 14348$

$\frac{700139224\pi}{1357856379}\approx 1.61987105309939310768424$

With regard the principal result, 10939058860032031 * 24 , we have that:

(10939058860032031 * 24)^1/79

Input:

$\sqrt[79]{10939058860032031\times 24}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

Approximate form

Step-by-step solution

$2^{3/79}\sqrt[79]{32817176580096093}$

Decimal approximation:

- More digits

1.6614837235828835061171859837095417287770003179804565011 42...

Alternate form:

root of $x^{79} - 262537412640768744$ near $x = 1.66148$

All 79th roots of 262537412640768744:

- More roots
- More digits
- Polar form

$2^{3/79} \sqrt[79]{32817176580096093}\ e^0 \approx 1.661484$ (real, principal root)

Open code

Enlarge Data Customize A Plaintext Interactive

$2^{3/79} \sqrt[79]{32817176580096093}\ e^{(2 i \pi)/79} \approx 1.65623 + 0.13201 i$

Open code

$2^{3/79} \sqrt[79]{32817176580096093}\ e^{(4 i \pi)/79} \approx 1.64051 + 0.26318 i$

Open code

$2^{3/79} \sqrt[79]{32817176580096093}\ e^{(6 i \pi)/79} \approx 1.61441 + 0.39268 i$

Open code

$2^{3/79} \sqrt[79]{32817176580096093}\ e^{(8 i \pi)/79} \approx 1.57811 + 0.5197 i$

Open code

1.661483723582883506117185983709541728777000317980456501142

This value 1,661483 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{20+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$-\csc\left(\cot\left(\frac{125\,694\,016}{20\,471\,823}\right)\right) \approx 1.6614837235828835084460$$

$$\text{root of } 7099\,x^3 - 4539\,x^2 - 45\,333\,x + 55\,290 \text{ near } x = 1.66148 \approx$$

$$1.6614837235828835055166$$

$$\frac{1\,100\,641\,694\,\pi}{2\,081\,132\,551} \approx 1.66148372358288350615071 8$$

And

(10939058860032031 * 24)^1/85

Input:

$$\sqrt[85]{10\,939\,058\,860\,032\,031 \times 24}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$2^{3/85}\,\sqrt[85]{32\,817\,176\,580\,096\,093}$$

Decimal approximation:

- More digits

$$1.602993130363918446428105914054790618724144702189038634454\ldots$$

(10939058860032031 * 24)^1/83

Input:

$\sqrt[83]{10\,939\,058\,860\,032\,031 \times 24}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$2^{3/83}\ \sqrt[83]{32\,817\,176\,580\,096\,093}$

Decimal approximation:

- More digits

1.621323858200818559036361999666530367161510567528589238624...

Note that:

(10939058860032031 * 24)^1/82

Input:

$\sqrt[82]{10\,939\,058\,860\,032\,031 \times 24}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$2^{3/82}\ \sqrt[82]{32\,817\,176\,580\,096\,093}$

Decimal approximation:

- More digits

1.630906865652213949705269369545931492615237821019178444444...

Open code

Alternate form:

root of $x^{82} - 262\,537\,412\,640\,768\,744$ near $x = 1.63091$

Thence:

1/3 * ((((((10939058860032031 * 24)^1/83 + (10939058860032031 * 24)^1/85 + (10939058860032031 * 24)^1/82))

Input:

$$\frac{1}{3}\left(\sqrt[83]{10\,939\,058\,860\,032\,031 \times 24} + \sqrt[85]{10\,939\,058\,860\,032\,031 \times 24} + \sqrt[82]{10\,939\,058\,860\,032\,031 \times 24}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$\frac{1}{3}\left(2^{3/85}\sqrt[85]{32\,817\,176\,580\,096\,093}+2^{3/83}\sqrt[83]{32\,817\,176\,580\,096\,093}+2^{3/82}\sqrt[82]{32\,817\,176\,580\,096\,093}\right)$$

Decimal approximation:

- More digits

1.6184079514056503183899124277557508261669643635789354391 74...

Alternate forms:

$$\frac{1}{3^{84/85}}2^{3/85}\sqrt[85]{10\,939\,058\,860\,032\,031}$$

$$\left(1+2^{6/7055}\times 32\,817\,176\,580\,096\,093^{2/7055}+2^{9/6970}\times 32\,817\,176\,580\,096\,093^{3/6970}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{2^{3/85}\sqrt[85]{10\,939\,058\,860\,032\,031}}{3^{84/85}}+\frac{2^{3/83}\sqrt[83]{10\,939\,058\,860\,032\,031}}{3^{82/83}}+\frac{2^{3/82}\sqrt[82]{10\,939\,058\,860\,032\,031}}{3^{81/82}}$$

1.6184079514056503183899124277557508261669643635789354391 74

This value 1,6184079 is a very good approximation to the golden ratio.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{12+\cfrac{1}{2+\cfrac{1}{27+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{181+\cfrac{1}{3+\cfrac{1}{5+\cfrac{1}{10+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{3453289931\,\pi}{6703396550} \approx 1.6184079514056503183829887$$

$$\frac{348\,e\,e! + 7458 - 605\,e + 698\,e^2}{3410\,e} \approx 1.6184079514056503183849718$$

$$\pi\ \text{root of } 2207 x^4 - 7755 x^3 + 872 x^2 + 1080 x + 117 \text{ near } x = 0.515155 \approx$$

1.6184079514056503183848416

Now, we return to the above expression:

$$j(\tau) = \frac{1}{q} + 744 + 196884q + 21493760q^2 + 864299970q^3 + 20245856256q^4 + \cdots$$

We note that:

196884, 21493760, 864299970 and 20245856256

(196884)^1/24

Input:

$$\sqrt[24]{196884}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$\sqrt[12]{2}\,\sqrt[8]{3}\,\sqrt[24]{1823}$$

Decimal approximation:

- More digits

1.6618510698259187686617533041118367068190773486696107262 97...

1.661851069825918768661753304111836706819077348669610726297

Possible closed forms:

- More

$$e^{3/2+11/e-21e+26/\pi+9\pi}\,\pi^{6e-2}\,(-\cos(e\,\pi))^{5/2}\csc(e\,\pi) \approx 1.661851069825918770774$$

Enlarge Data Customize A Plaintext Interactive

$$\frac{580\,e\,e! + 4221 - 8778\,e + 1810\,e^2}{100\,e} \approx 1.661851069825918768 42896$$

$$\log\left(\frac{1}{70}\left(218 - 57\sqrt{2} - 122\,e - 28\,e^2 - 600\,\pi + 269\,\pi^2\right)\right) \approx$$

1.661851069825918768 75244

•

(21493760)^1/33

Input:

$\sqrt[33]{21493760}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$\sqrt[3]{2}\ \sqrt[33]{10495}$

Decimal approximation:

- More digits

1.667981712173921708702579158480649311295496395330737426884...

1.667981712173921708702579158480649311295496395330737426884

Possible closed forms:

- More

$\frac{1}{7}\sqrt{\frac{2}{11}(143-553e+729\pi-260\log(2))} \approx 1.66798171217392170887449$

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$\frac{2656273788\pi}{5003010619} \approx 1.66798171217392170873342 5$

root of $448x^5 - 448x^4 - 571x^3 - 50x^2 + 649x - 610$ near $x = 1.66798$ ≈ 1.66798171217392170868905

(864299970)^1/41

Input:

$\sqrt[41]{864299970}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$3^{5/41}\ \sqrt[41]{3556790}$

Decimal approximation:

- More digits

1.651837901422508270745515274482122909077629512925852052567...

1.651837901422508270745515274482122909077629512925852052567

Possible closed forms:

- More

$-\frac{3(-4470-616e+43e^2)}{3893e} \approx 1.65183790142250827054572$

Enlarge Data Customize A Plaintext Interactive

$-\frac{2}{3}(73e^{\pi} - 976\pi - 474\log(\pi) + 286\log(2\pi) + 1102\tan^{-1}(\pi)) \approx$ 1.65183790142250827420 64

$\frac{5}{4}\pi\sin^2\left(\frac{36853827}{52223216}\right) \approx 1.65183790142250827074 01482$

(20245856256)^1/47

Input:

$\sqrt[47]{20245856256}$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$2^{14/47} \times 3^{3/47} \sqrt[47]{45767}$

Decimal approximation:

- More digits

1.656852120171993470196854751249842224313942859629294901244...

1.656852120171993470196854751249842224313942859629294901244

Possible closed forms:

- More

π root of $1579 x^4 - 3315 x^3 - 1360 x^2 + 270 x + 600$ near $x = 0.527392$ $\approx$ 1.656852120171993470021439

Enlarge Data Customize A Plaintext Interactive

$\frac{6222535142 \pi}{11798681639} \approx 1.656852120171993470197554 8$

$\frac{1}{4}(150 C + 297 - 304 \pi + 45 \pi^2 - 301 \pi \log(2) + 214 \pi \log(3)) \approx$ 1.65685212017199346980 7

-

In conclusion, we have:

1/4 * [(196884)^1/24 +(21493760)^1/33+(864299970)^1/41+(20245856256)^1/47]

Input:

$\frac{1}{4}\left(\sqrt[24]{196884} + \sqrt[33]{21493760} + \sqrt[41]{864299970} + \sqrt[47]{20245856256}\right)$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$\frac{1}{4}\left(\sqrt[12]{2} \sqrt[8]{3} \sqrt[24]{1823} + \sqrt[3]{2} \sqrt[33]{10495} + 2^{14/47} \times 3^{3/47} \sqrt[47]{45767} + 3^{5/41} \sqrt[41]{3556790}\right)$

Decimal approximation:

- More digits

1.659630700898585554576675622081112787876536529138873776748...

Open code

Alternate forms:

$\frac{1}{2 \times 2^{40/41}}\left(2^{29/492} \sqrt[8]{3} \sqrt[24]{1823} + 2^{38/123} \sqrt[33]{10495} + 2^{527/1927} \times 3^{3/47} \sqrt[47]{45767} + 3^{5/41} \sqrt[41]{1778395}\right)$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\sqrt[8]{3}\ \sqrt[24]{1823}}{2\times 2^{11/12}}+\frac{\sqrt[33]{10495}}{2\times 2^{2/3}}+\frac{3^{3/47}\ \sqrt[47]{45767}}{2\times 2^{33/47}}+\frac{3^{5/41}\ \sqrt[41]{1778395}}{2\times 2^{40/41}}$$

1.6596307008985855545766756220811127878765365291388737776748

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{15+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{73+\cfrac{1}{6+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

π root of $68x^4-1038x^3-823x^2-781x+790$ near $x=0.528277$ $\approx$ 1.659630700898585554537768

$\frac{787440187\pi}{1490582396}\approx 1.659630700898585554599800$

π root of $9838x^3+111440x^2-48527x-6915$ near $x=0.528277$ $\approx$ 1.659630700898585554577 5998

From the 47th root of the sum of the four values, we obtain:

[(196884) +(21493760)+(864299970)+(20245856256)]^1/47

Input:

$$\sqrt[47]{196884+21493760+864299970+20245856256}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$\sqrt[47]{21131846870}$

Decimal approximation:

- More digits

1.6583626973336635103122757243490382076819981585288213136...

1.658362697333663510312275724349038207681998158528821313636

This value 1,658362 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{12+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{42+\cfrac{1}{1+\cfrac{1}{17+\cfrac{1}{2+\cfrac{1}{26+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{79+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$\frac{318939138\pi}{604196449} \approx 1.65836269733366351028240$

root of $9760x^3 - 38430x^2 + 17812x + 31637$ near $x = 1.65836$ ≈

1.65836269733366351026652

π root of $52966x^3 - 45227x^2 + 1153x + 4203$ near $x = 0.527873$ ≈

1.65836269733366351028018

We have also that:

1/2 * (((([(196884) +(21493760)+(864299970)+(20245856256)]^1/49 + [(196884) +(21493760)+(864299970)+(20245856256)]^1/50))))

Input:

$$\frac{1}{2}\left(\sqrt[49]{196\,884+21\,493\,760+864\,299\,970+20\,245\,856\,256}+\sqrt[50]{196\,884+21\,493\,760+864\,299\,970+20\,245\,856\,256}\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$\frac{1}{2}\left(\sqrt[50]{21\,131\,846\,870}+\sqrt[49]{21\,131\,846\,870}\right)$$

Decimal approximation:

- More digits

1.616631329333862904719853132465414230688506142720011616094...

Open code

1.616631329333862904719853132465414230688506142720011616094

This value 1,616631 is very near to the golden ratio. It can be defined a golden number.

Alternate forms:

$$\frac{\sqrt[50]{10\,565\,923\,435}\left(1+\sqrt[2450]{21\,131\,846\,870}\right)}{2^{49/50}}$$

Open code

$$\frac{\sqrt[50]{10\,565\,923\,435}}{2^{49/50}}+\frac{\sqrt[49]{10\,565\,923\,435}}{2^{48/49}}$$

Open code

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{25+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{12+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{158850235\,\pi}{308692973} \approx 1.61663132933386290439206$$

$$-\frac{2\left(-309-212\,e+85\,e^2\right)}{555-204\,e+43\,e^2} \approx 1.61663132933386290091615$$

$$\log\left(\frac{1}{78}\left(-50+287\sqrt{2}-319\,e+164\,e^2+12\,\pi-35\,\pi^2\right)\right) \approx 1.61663132933386290490558$$

Note that, if we regularize this last expression multiplying for 10^{-35}, we obtain a result practically equal to the Planck length. Indeed:

Input:

$$\frac{1}{2}\left(\sqrt[49]{196884+21493760+864299970+20245856256}+\sqrt[50]{196884+21493760+864299970+20245856256}\right)\times\frac{1}{10^{35}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$\frac{\sqrt[50]{21131846870}+\sqrt[49]{21131846870}}{200000000000000000000000000000000000}$$

Decimal approximation:

- More digits

$$1.616631329333862904719853132465414230688506142720011 6\ldots\times10^{-35}$$

Open code

1.6166313293338629047198531324654142306885061427200116 × 10^{-35}

1.6166313293... × 10^{-35}

$$\ell_P = \sqrt{\frac{\hbar G}{c^3}} \qquad 1\,\ell_P \approx 1.616\,229(38) \times 10^{-35}\ \mathrm{m}$$

Or:

[(196884) +(21493760)+(864299970)+(20245856256)]^1/(495.191/10) *1/10^35

Input interpretation:

$$\sqrt[\frac{495.191}{10}]{196\,884 + 21\,493\,760 + 864\,299\,970 + 20\,245\,856\,256} \times \frac{1}{10^{35}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.6162336403126797183038065018378372745726155857129625... × 10^{-35}

1.61623364... × 10^{-35}

where 495,191 is an average value of the four Kaon mesons rest masses.

We have also that:

(((([(196884) +(21493760)+(864299970)+(20245856256)]^1/47))) * (0.9243408+0.9239102+0.0814135+0.081816+0.07609)/2 * 10^3

where 0.9243408, 0.9239102, 0.0814135, 0.081816 and 0.07609 are results of Ramanujan's mock theta functions (see our previous papers)

Input interpretation:

$$\sqrt[47]{196\,884 + 21\,493\,760 + 864\,299\,970 + 20\,245\,856\,256}\left(\frac{1}{2}(0.9243408 + 0.9239102 + 0.0814135 + 0.081816 + 0.07609)\right) \times 10^3$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1730.9745226270923005271762950085919328649063683995453870 59...

1730.9745226270923005271762950085919328649063683995453

This result is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

Possible closed forms:

- More

$$\frac{-5582\, e\, e! - 23950 - 4865\, e + 27790\, e^2}{22\, e} \approx 1730.97452262709230053 6341$$

Enlarge Data Customize A Plaintext Interactive

$$\frac{5112\, \pi\, \pi! + 5511 + 15761\, \pi - 5701\, \pi^2}{21\, \pi} \approx 1730.9745226270923005 43489$$

$$-\frac{3773}{2} + \frac{959}{\pi} - \frac{423}{\sqrt{\pi}} + \frac{4581\sqrt{\pi}}{2} - 162\, \pi \approx 1730.9745226270923005 211858$$

Or:

(((([(196884) +(21493760)+(864299970)+(20245856256)]^1/47)))) * (64*16+27-9)

Input:

$$\sqrt[47]{196884 + 21493760 + 864299970 + 20245856256}\ (64 \times 16 + 27 - 9)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Approximate form
- Step-by-step solution

$$1042\, \sqrt[47]{21131846870}$$

Decimal approximation:

- More digits

1728.013930621677377745391304771697812404642081187031808809...

1728.013930621677377745391304771697812404642081187031808809

Continued fraction:

- Linear form

$$1728+\cfrac{1}{71+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{45+\cfrac{1}{10+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{226+\cfrac{1}{1+\cfrac{1}{\dots}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

More

- $\frac{-4801\, e\, e! + 871 + 29\,260\, e + 8086\, e^2}{18\, e} \approx 1728.01393062167737760594$

  $\frac{1}{10}\left(583\, e^{\pi} + 282\,\pi + 3714\log(\pi) + 628\log(2\,\pi) - 1982\tan^{-1}(\pi)\right) \approx$
  $1728.01393062167737774444659$

  $\frac{9574\,\zeta(3)}{7} - 256\,\zeta(5) + 85\,\pi^2 - \frac{1583\,\pi^4}{315} \approx 1728.01393062167737756877$

- $n!$ is the factorial function
- $\tan^{-1}(x)$ is the inverse tangent function
- $\log(x)$ is the natural logarithm
- $\zeta(s)$ is the Riemann zeta function

This result 1728,01393 is very near to the mass of candidate glueball f_0(1710) meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

We note that the mean of the two results is:

1/2*(1728.013930621677377745391304771697812404642081187031808809+1730.9745226270923005271762950085919328649063683995453)

Input interpretation:

$$\frac{1}{2}(1728.013930621677377745391304771697812404642081187031808809 + 1730.974522627092300527176295008591932864906368399545 3)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

1729.494226624384839136283799890144872634774224793288554404...

1729.494226624384839136283799890144872634774224793288554404

Continued fraction:

- Linear form

$$1729+\cfrac{1}{2+\cfrac{1}{42+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{17+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{11+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{13+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{439\,e!}{2}-\frac{9283}{12}-\frac{2312}{e}+\frac{2669\,e}{3}\approx 1729.49422662438483914652 8$$

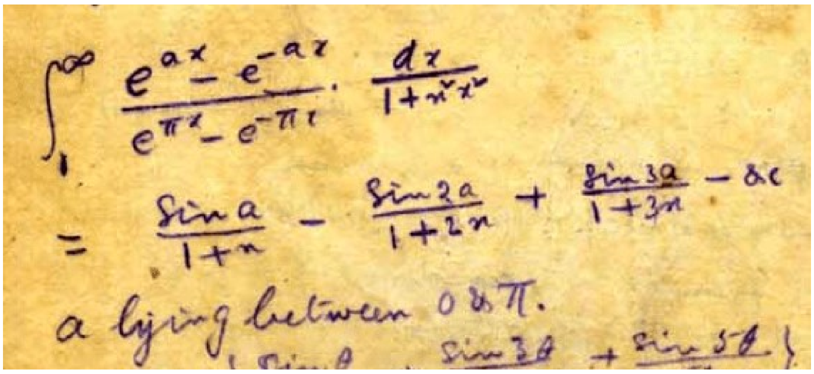
$$\frac{-99\,692+300\,468\,\pi+6395\,\pi^2}{167\,\pi}\approx 1729.49422662438483911991 3$$

$$\frac{1}{9}\left(12\,005\,\zeta(3)-13\,593\,\zeta(5)+112\,\pi^2+145\,\pi^4\right)\approx 1729.4942266243848391327685$$

- $n!$ is the factorial function
- $\zeta(s)$ is the Riemann zeta function

This result 1729,4942 is very near to the Hardy–Ramanujan number 1729.

Now, we have:



https://math.stackexchange.com/questions/1418289/an-integral-identity-from-ramanujans-notebooks

For n = 2 and a = 2,5 we have that:

(((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2))))))

Input:

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

0.525275566316052076264743943600259633300048232010284932567...

Alternative representations:

- More

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \frac{1}{3\csc(2.5)} - \frac{1}{5\csc(5)} + \frac{1}{7\csc(7.5)}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \frac{1}{3}\cos\left(-2.5+\frac{\pi}{2}\right) - \frac{1}{5}\cos\left(-5+\frac{\pi}{2}\right) + \frac{1}{7}\cos\left(-7.5+\frac{\pi}{2}\right)$$

Open code

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = -\frac{1}{3}\cos\left(2.5+\frac{\pi}{2}\right) + \frac{1}{5}\cos\left(5+\frac{\pi}{2}\right) - \frac{1}{7}\cos\left(7.5+\frac{\pi}{2}\right)$$

Series representations:

- More

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \sum_{k=0}^{\infty} \frac{(-1)^k \left(0.833333\, e^{1.83258\,k} - e^{3.21888\,k} + 1.07143\, e^{4.02981\,k}\right)}{(1+2\,k)!}$$

Open code

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$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \sum_{k=0}^{\infty} \frac{\sin\left(\frac{k\pi}{2} + z_0\right)\left(35\,(2.5 - z_0)^k - 21\,(5 - z_0)^k + 15\,(7.5 - z_0)^k\right)}{105\,k!}$$

Open code

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \sum_{k=0}^{\infty} \frac{(-1)^k \left(35\left(2.5 - \frac{\pi}{2}\right)^{2k} - 21\left(5 - \frac{\pi}{2}\right)^{2k} + 15\left(7.5 - \frac{\pi}{2}\right)^{2k}\right)}{105\,(2\,k)!}$$

Integral representations:

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \int_0^1 (0.833333\cos(2.5\,t) - \cos(5\,t) + 1.07143\cos(7.5\,t))\,dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{e^{-21.875/s+s}\left(0.267857\, e^{7.8125/s} - 0.25\, e^{15.625/s} + 0.208333\, e^{20.3125/s}\right)\sqrt{\pi}}{i\,\pi\, s^{3/2}}\,ds \quad \text{for } \gamma > 0$$

Open code

$$\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2} = \int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{e^{-4.92238\,s}\left(0.267857\, e^{2.27887\,s} - 0.25\, e^{3.0898\,s} + 0.208333\, e^{4.47609\,s}\right)\Gamma(s)\sqrt{\pi}}{i\,\pi\,\Gamma\left(\frac{3}{2} - s\right)}\,ds \quad \text{for } 0 < \gamma < 1$$

((sqrt(3)/2))*1 / (((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2))))))

Input:

$$\frac{\sqrt{3}}{2} \times \frac{1}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.648706810899636317800985515303336448631444087218442864884...

1.6487068108996363178009855153033364486314440872184428

This value 1,6487068 is very near to the golden ratio. It can be defined a golden number.

Alternative representations:

- More

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{\sqrt{3}}{2\left(\frac{1}{3\csc(2.5)} - \frac{1}{5\csc(5)} + \frac{1}{7\csc(7.5)}\right)}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{\sqrt{3}}{2\left(\frac{1}{3}\cos\left(-2.5+\frac{\pi}{2}\right) - \frac{1}{5}\cos\left(-5+\frac{\pi}{2}\right) + \frac{1}{7}\cos\left(-7.5+\frac{\pi}{2}\right)\right)}$$

Open code

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{\sqrt{3}}{2\left(-\frac{1}{3}\cos\left(2.5+\frac{\pi}{2}\right) + \frac{1}{5}\cos\left(5+\frac{\pi}{2}\right) - \frac{1}{7}\cos\left(7.5+\frac{\pi}{2}\right)\right)}$$

Series representations:

- More

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{105\sqrt{2}\sum_{k=0}^{\infty} 2^{-k}\binom{\frac{1}{2}}{k}}{\sum_{k=0}^{\infty} 4(-1)^k \left(35 J_{1+2k}(2.5) - 21 J_{1+2k}(5) + 15 J_{1+2k}(7.5)\right)}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{105 \exp\left(i\pi \left\lfloor \frac{\arg(3-x)}{2\pi} \right\rfloor\right) \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k (3-x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}}{\sum_{k=0}^{\infty} \frac{(-1)^k \left(175 e^{1.83258 k} - 210 e^{3.21888 k} + 225. e^{4.02981 k}\right)}{(1+2k)!}}$$

for ($x \in \mathbb{R}$ and $x < 0$)

Open code

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{105 \exp\left(i\pi \left\lfloor \frac{\arg(3-x)}{2\pi} \right\rfloor\right) \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k (3-x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}}{\sum_{k=0}^{\infty} \frac{2 \sin\left(\frac{k\pi}{2} + z_0\right)\left(35 (2.5 - z_0)^k - 21 (5 - z_0)^k + 15 (7.5 - z_0)^k\right)}{k!}}$$

for ($x \in \mathbb{R}$ and $x < 0$)

Integral representations:

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{0.6\sqrt{3}}{\int_0^1 (\cos(2.5\,t) - 1.2 \cos(5\,t) + 1.28571 \cos(7.5\,t))\,dt}$$

Open code

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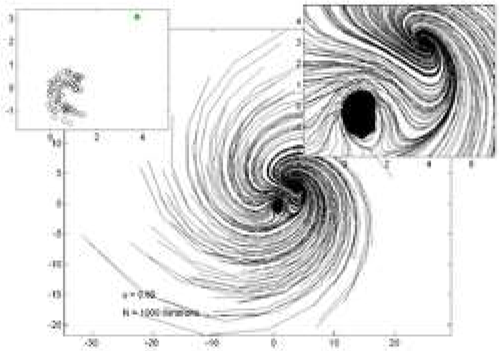
$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{1.86667\, i\pi\sqrt{3}}{\sqrt{\pi} \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{e^{-21.875/s+s}\left(e^{7.8125/s} - 0.933333\, e^{15.625/s} + 0.777778\, e^{20.3125/s}\right)}{s^{3/2}}\,ds} \quad \text{for } \gamma > 0$$

Open code

$$\frac{\sqrt{3}}{\left(\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}\right)2} = \frac{105\, i\pi\sqrt{3}}{\sqrt{\pi} \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{\left(56.25\, e^{-2.64351\, s} - 52.5\, e^{-1.83258\, s} + 43.75\, e^{-0.446287\, s}\right)\Gamma(s)}{\Gamma\left(\frac{3}{2} - s\right)}\,ds} \quad \text{for } 0 < \gamma < 1$$

0.85 / (((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2))))))

Where 0,85 is a point trajectory *u* of Ikeda map (from Wikipedia)



u = 0.85

Input:

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1.618198245849046564239849423375290165214435455677125942654...

1.6181982458490465642398494233752901652144354556771259

Alternative representations:

- More

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{0.85}{\frac{1}{3\csc(2.5)} - \frac{1}{5\csc(5)} + \frac{1}{7\csc(7.5)}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{0.85}{\frac{1}{3}\cos\left(-2.5+\frac{\pi}{2}\right) - \frac{1}{5}\cos\left(-5+\frac{\pi}{2}\right) + \frac{1}{7}\cos\left(-7.5+\frac{\pi}{2}\right)}$$

Open code

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{0.85}{-\frac{1}{3}\cos\left(2.5+\frac{\pi}{2}\right) + \frac{1}{5}\cos\left(5+\frac{\pi}{2}\right) - \frac{1}{7}\cos\left(7.5+\frac{\pi}{2}\right)}$$

Series representations:

- More

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{2.55}{\sum_{k=0}^{\infty} \frac{(-1)^k \left(2.5^{1+2k} - 3 e^{3.21888 k} + 3.21429 e^{4.02981 k}\right)}{(1+2k)!}}$$

Open code

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$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{2.55}{\sum_{k=0}^{\infty} \frac{\sin\left(\frac{k\pi}{2}+z_0\right)\left((2.5-z_0)^k - 0.6(5-z_0)^k + 0.428571(7.5-z_0)^k\right)}{k!}}$$

Open code

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{2.55}{\sum_{k=0}^{\infty} \frac{(-1)^k\left((2.5-\frac{\pi}{2})^{2k} - 0.6(5-\frac{\pi}{2})^{2k} + 0.428571(7.5-\frac{\pi}{2})^{2k}\right)}{(2k)!}}$$

Integral representations:

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{1.02}{\int_0^1 (\cos(2.5\,t) - 1.2\cos(5\,t) + 1.28571\cos(7.5\,t))\,dt}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{3.17333\,i\,\pi}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{e^{-21.875/s+s}\left(e^{7.8125/s} - 0.933333\,e^{15.625/s} + 0.777778\,e^{20.3125/s}\right)}{s^{3/2}}\,ds} \quad \text{for } \gamma > 0$$

Open code

$$\frac{0.85}{\frac{\sin(2.5)}{1+2} - \frac{\sin(2\times 2.5)}{1+2\times 2} + \frac{\sin(3\times 2.5)}{1+3\times 2}} = \frac{11.9\,i\,\pi}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{\left(3.75\,e^{-2.64351\,s} - 3.5\,e^{-1.83258\,s} + 2.91667\,e^{-0.446287\,s}\right)\Gamma(s)}{\Gamma\left(\frac{3}{2}-s\right)}\,ds} \quad \text{for } 0 < \gamma < 1$$

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{19+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{6+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$\log\left(\frac{1}{268}\left(-358-7\sqrt{2}-38e+211e^2+84\pi\right)\right) \approx 1.61819824584904656425108 7$

π root of $2400x^4+2889x^3+172x^2-523x-340$ near $x=0.515088$ $\approx$ 1.618198245849046564260622

$\frac{350716649\pi}{680886196} \approx 1.61819824584904656401122$

This value 1,618198 is a very good approximation to the golden ratio.

((sqrt(3)/2))*1 / (((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2)))))) * (13*8) *(8+2) +13

Input:

$$\frac{\sqrt{3}}{2}\times\frac{1}{\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}}(13\times 8)(8+2)+13$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- Fewer digits
- More digits

1727.655083335621770513024935915469906576701850707180579479...

1727.6550833356217705130249359154699065767018507071805

Series representations:

- More

$$\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13=$$
$$\frac{13\left(\sum_{k=0}^{\infty}(-1)^k\,(35\,J_{1+2k}(2.5)-21\,J_{1+2k}(5)+15\,J_{1+2k}(7.5))+2100\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)}{\sum_{k=0}^{\infty}(-1)^k\,(35\,J_{1+2k}(2.5)-21\,J_{1+2k}(5)+15\,J_{1+2k}(7.5))}$$

Open code

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$$\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13=$$
$$\left(13\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(87.5\,e^{1.83258\,k}-105\,e^{3.21888\,k}+112.5\,e^{4.02981\,k}\right)}{(1+2k)!}+4200\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Bigg/\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(87.5\,e^{1.83258\,k}-105\,e^{3.21888\,k}+112.5\,e^{4.02981\,k}\right)}{(1+2k)!}\right)\quad\text{for } (x\in\mathbb{R}\text{ and }x<0)$$

Open code

$$\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13=$$
$$\left(13\left(4200\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\sum_{k=0}^{\infty}\frac{\sin\left(\frac{k\pi}{2}+z_0\right)\left(35\,(2.5-z_0)^k-21\,(5-z_0)^k+15\,(7.5-z_0)^k\right)}{k!}\right)\right)\Bigg/\left(\sum_{k=0}^{\infty}\frac{\sin\left(\frac{k\pi}{2}+z_0\right)\left(35\,(2.5-z_0)^k-21\,(5-z_0)^k+15\,(7.5-z_0)^k\right)}{k!}\right)$$
$$\text{for } (x\in\mathbb{R}\text{ and }x<0)$$

Integral representations:

$$\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13=$$
$$13+\frac{624.\sqrt{3}}{\int_0^1(\cos(2.5\,t)-1.2\cos(5\,t)+1.28571\cos(7.5\,t))\,dt}$$

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$$\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13=$$

$$13+\frac{1941.33\,i\,\pi\,\sqrt{3}}{\sqrt{\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-21.875/s+s}\left(e^{7.8125/s}-0.933333\,e^{15.625/s}+0.777778\,e^{20.3125/s}\right)}{s^{3/2}}\,ds}\quad \text{for } \gamma>0$$

Open code

$$\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13=$$

$$13+\frac{520\sqrt{3}}{\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-4.92238\,s}\left(0.267857\,e^{2.27887\,s}-0.25\,e^{3.0898\,s}+0.208333\,e^{4.47609\,s}\right)\Gamma(s)\sqrt{\pi}}{i\,\pi\,\Gamma\left(\frac{3}{2}-s\right)}\,ds}\quad \text{for } 0<\gamma<1$$

This result is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

((((((((sqrt(3)/2))*1 / (((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2)))))) * (13*8) *(8+2) +13))))))^1/3

Input:

$$\sqrt[3]{\frac{\sqrt{3}}{2}\times\frac{1}{\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}}(13\times 8)(8+2)+13}$$

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Result:

- More digits

11.9992...

11.9992

This result is very near to the value of black hole entropy 12,1904

2*((((((((sqrt(3)/2))*1 / (((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2)))))) * (13*8) *(8+2) +13))))))^1/3

Input:

$$2\sqrt[3]{\frac{\sqrt{3}}{2}\times\frac{1}{\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times2.5)}{1+2\times2}+\frac{\sin(3\times2.5)}{1+3\times2}}(13\times8)(8+2)+13}$$

Open code

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Result:

- Fewer digits
- More digits

23.99840305733378670613693580857245246812107123558458296167...

23.998403057333786706136935808572452468121071235584582

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

Series representations:

- More

$$2\sqrt[3]{\frac{\sqrt{3}\,(13\times8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times2.5)}{1+2\times2}+\frac{\sin(3\times2.5)}{1+3\times2}\right)}+13}=2\sqrt[3]{13+\frac{27300\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}}{\sum_{k=0}^{\infty}(-1)^k\left(35\,J_{1+2k}(2.5)-21\,J_{1+2k}(5)+15\,J_{1+2k}(7.5)\right)}}$$

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$$2\sqrt[3]{\frac{\sqrt{3}\,(13\times8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times2.5)}{1+2\times2}+\frac{\sin(3\times2.5)}{1+3\times2}\right)}+13}=2\sqrt[3]{13+\frac{520\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(0.833333\,e^{1.83258\,k}-e^{3.21888\,k}+1.07143\,e^{4.02981\,k}\right)}{(1+2k)!}}}$$

for $(x\in\mathbb{R}$ and $x<0)$

Open code

$$2\sqrt[3]{\frac{\sqrt{3}\,(13\times8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times2.5)}{1+2\times2}+\frac{\sin(3\times2.5)}{1+3\times2}\right)}+13}=2\sqrt[3]{13+\frac{520\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{\sum_{k=0}^{\infty}\frac{\sin\left(\frac{k\pi}{2}+z_0\right)\left(35(2.5-z_0)^k-21(5-z_0)^k+15(7.5-z_0)^k\right)}{105\,k!}}}\quad\text{for }(x\in\mathbb{R}\text{ and }x<0)$$

Integral representations:

$$2\sqrt[3]{\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13} = 2\sqrt[3]{13+\frac{624.\sqrt{3}}{\int_0^1 (\cos(2.5\,t)-1.2\cos(5\,t)+1.28571\cos(7.5\,t))\,dt}}$$

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$$2\sqrt[3]{\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13} = 2\sqrt[3]{13+\frac{520\sqrt{3}}{\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-21.875/s+s}\left(0.267857\,e^{7.8125/s}-0.25\,e^{15.625/s}+0.208333\,e^{20.3125/s}\right)\sqrt{\pi}}{i\,\pi\,s^{3/2}}\,ds}}$$

for $\gamma > 0$

Open code

$$2\sqrt[3]{\frac{\sqrt{3}\,(13\times 8)(8+2)}{2\left(\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}\right)}+13} = 2\sqrt[3]{13+\frac{520\sqrt{3}}{\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-4.92238\,s}\left(0.267857\,e^{2.27887\,s}-0.25\,e^{3.0898\,s}+0.208333\,e^{4.47609\,s}\right)\Gamma(s)\sqrt{\pi}}{i\,\pi\,\Gamma\left(\frac{3}{2}-s\right)}\,ds}}$$

for $0 < \gamma < 1$

((((((((sqrt(3)/2))*1 / (((((sin(2.5) / (1+2) – sin(2*2.5) / (1+2*2) + sin(3*2.5) / (1+3*2)))))) * (13*8) *(8+2) +13))))))^1/15

Input:

$$\sqrt[15]{\frac{\sqrt{3}}{2}\times\frac{1}{\frac{\sin(2.5)}{1+2}-\frac{\sin(2\times 2.5)}{1+2\times 2}+\frac{\sin(3\times 2.5)}{1+3\times 2}}(13\times 8)(8+2)+13}$$

Open code

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Result:

- Fewer digits
- More digits

1.6437299541230786577817772941785963323641114234307412874O8...

1.643729954123078657781777294178596332364111423430 7412

This value 1,643729 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{12+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{40+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

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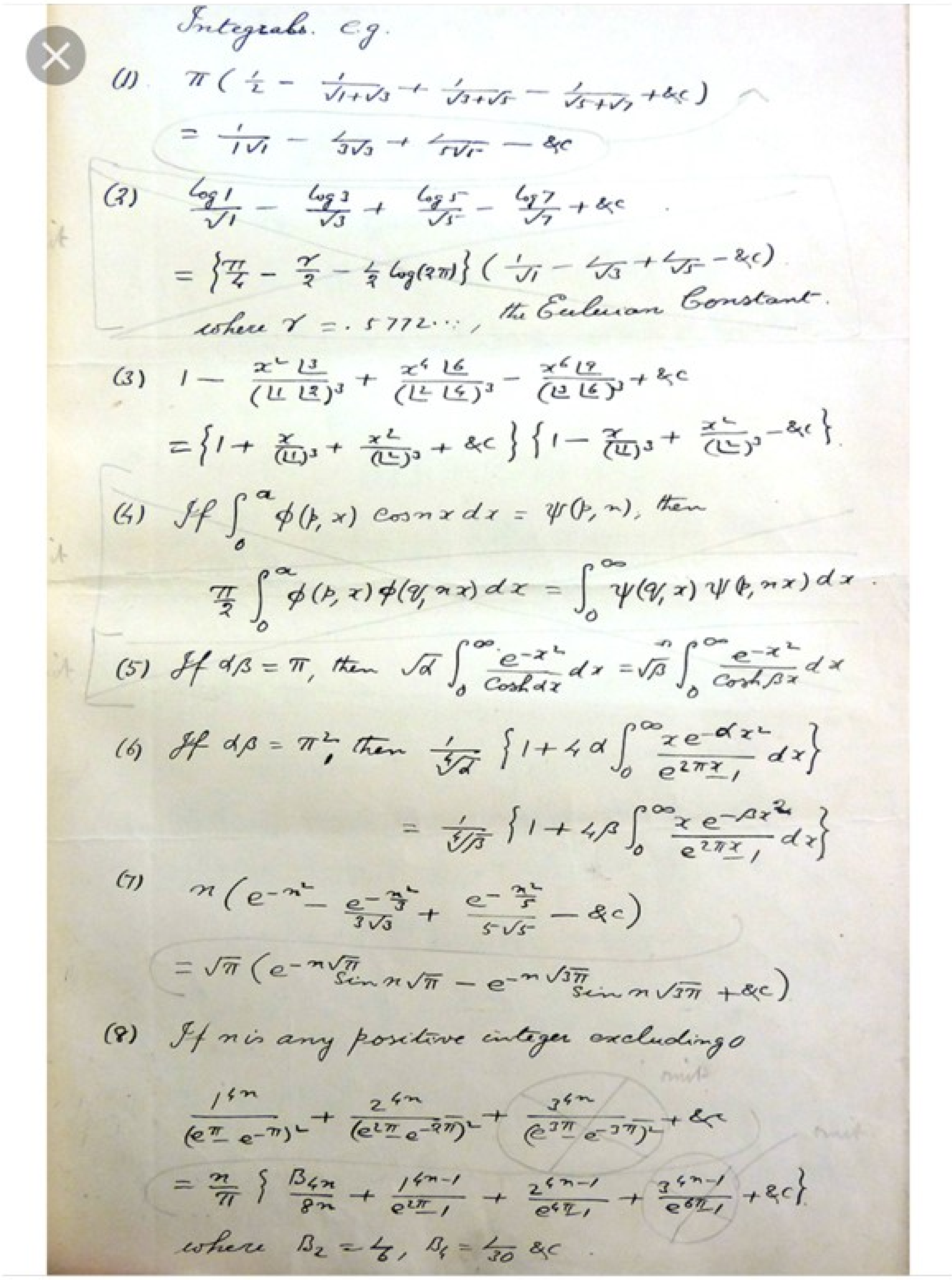
Possible closed forms:

- More

$-e^{22+59/e-10e-71/\pi-13\pi}\,\pi^{18+8e}\tan^5(e\pi)\sec^2(e\pi) \approx 1.6437299541230786582171$

$\frac{\left(\frac{38807593}{4347867}\right)^{3/4}}{\pi} \approx 1.64372995412307861860 9$

$\frac{1376790807\pi}{2631402971} \approx 1.643729954123078657778913$



Integrals. e.g.

(1) $$\pi\left(\frac{1}{2} - \frac{1}{\sqrt{1}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{5}} - \frac{1}{\sqrt{5}+\sqrt{7}} + \&c\right) = \frac{1}{1\sqrt{1}} - \frac{1}{3\sqrt{3}} + \frac{1}{5\sqrt{5}} - \&c$$

(2) $$\frac{\log 1}{\sqrt{1}} - \frac{\log 3}{\sqrt{3}} + \frac{\log 5}{\sqrt{5}} - \frac{\log 7}{\sqrt{7}} + \&c = \left\{\frac{\pi}{4} - \frac{\gamma}{2} - \frac{1}{2}\log(2\pi)\right\}\left(\frac{1}{\sqrt{1}} - \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{5}} - \&c\right).$$

where $\gamma = .5772\cdots$, the Eulerian Constant.

(3) $$1 - \frac{x^2\, 3!}{(1!\,2!)^3} + \frac{x^4\, 6!}{(2!\,4!)^3} - \frac{x^6\, 9!}{(3!\,6!)^3} + \&c = \left\{1 + \frac{x}{(1!)^3} + \frac{x^2}{(2!)^3} + \&c\right\}\left\{1 - \frac{x}{(1!)^3} + \frac{x^2}{(2!)^3} - \&c\right\}.$$

(4) If $\int_0^\infty \phi(p,x)\cos nx\,dx = \psi(p,n)$, then

$$\frac{\pi}{2}\int_0^\infty \phi(p,x)\phi(q,nx)\,dx = \int_0^\infty \psi(q,x)\psi(p,nx)\,dx.$$

(5) If $\alpha\beta = \pi$, then $\sqrt{\alpha}\int_0^\infty \frac{e^{-x^2}}{\cosh \alpha x}dx = \sqrt{\beta}\int_0^\infty \frac{e^{-x^2}}{\cosh \beta x}dx$

(6) If $\alpha\beta = \pi^2$, then $$\frac{1}{\sqrt[4]{\alpha}}\left\{1 + 4\alpha\int_0^\infty \frac{x e^{-\alpha x^2}}{e^{2\pi x}-1}dx\right\} = \frac{1}{\sqrt[4]{\beta}}\left\{1 + 4\beta\int_0^\infty \frac{x e^{-\beta x^2}}{e^{2\pi x}-1}dx\right\}$$

(7) $$n\left(e^{-n^2} - \frac{e^{-\frac{n^2}{3}}}{3\sqrt{3}} + \frac{e^{-\frac{n^2}{5}}}{5\sqrt{5}} - \&c\right) = \sqrt{\pi}\left(e^{-n\sqrt{\pi}}\sin n\sqrt{\pi} - e^{-n\sqrt{3\pi}}\sin n\sqrt{3\pi} + \&c\right)$$

(8) If n is any positive integer excluding 0

$$\frac{1^{4n}}{(e^{\pi}-e^{-\pi})^2} + \frac{2^{4n}}{(e^{2\pi}-e^{-2\pi})^2} + \frac{3^{4n}}{(e^{3\pi}-e^{-3\pi})^2} + \&c = \frac{n}{\pi}\left\{\frac{B_{4n}}{8n} + \frac{1^{4n-1}}{e^{2\pi}-1} + \frac{2^{4n-1}}{e^{4\pi}-1} + \frac{3^{4n-1}}{e^{6\pi}-1} + \&c\right\}$$

where $B_2 = \frac{1}{6}$, $B_4 = \frac{1}{30}$ &c.

Page from Ramanujan’s Notebook manuscript

From eq. (7) of above manuscript, we have that:

sqrt(Pi) * ((((e^((-2sqrt(Pi))) * (((((sin ((2sqrt(Pi)))) - ((((e^((-2sqrt(3Pi))) * (((((sin ((2sqrt(3Pi)))))

Input:

$$\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)$$

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Exact result:

$$e^{-2\sqrt{\pi}}\sqrt{\pi}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)$$

Decimal approximation:

- More digits

−0.02006811350054571936340564661112991089574327659186184116...

Alternate forms:

- More

$$e^{-2\sqrt{\pi}-2\sqrt{3\pi}}\sqrt{\pi}\left(e^{2\sqrt{3\pi}}\sin\left(2\sqrt{\pi}\right)-\sin\left(2\sqrt{3\pi}\right)\right)$$

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$$e^{-2\sqrt{\pi}}\sqrt{\pi}\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{\pi}-2\sqrt{3\pi}}\sqrt{\pi}\sin\left(2\sqrt{3\pi}\right)$$

Open code

$$2e^{-2\sqrt{\pi}}\sqrt{\pi}\sin\left(\sqrt{\pi}\right)\cos\left(\sqrt{\pi}\right)-2e^{-2\sqrt{\pi}-2\sqrt{3\pi}}\sqrt{\pi}\sin\left(\sqrt{3\pi}\right)\cos\left(\sqrt{3\pi}\right)$$

Continued fraction:

- Linear form

$$\cfrac{1}{-49+\cfrac{1}{-1+\cfrac{1}{-4+\cfrac{1}{-1+\cfrac{1}{-8+\cfrac{1}{-3+\cfrac{1}{-3+\cfrac{1}{-1+\cfrac{1}{-5+\cfrac{1}{-2+\cfrac{1}{-2+\cfrac{1}{-15+\cfrac{1}{-15+\cfrac{1}{-1+\cfrac{1}{-6+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}$$

Alternative representations:

- More

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = e^{-2\sqrt{\pi}} \left(\frac{1}{\csc(2\sqrt{\pi})} - \frac{e^{-2\sqrt{3\pi}}}{\csc(2\sqrt{3\pi})}\right)\sqrt{\pi}$$

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$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = e^{-2\sqrt{\pi}} \left(\cos\left(\frac{\pi}{2} - 2\sqrt{\pi}\right) - \cos\left(\frac{\pi}{2} - 2\sqrt{3\pi}\right) e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}$$

Open code

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = e^{-2\sqrt{\pi}} \left(-\cos\left(\frac{\pi}{2} + 2\sqrt{\pi}\right) + \cos\left(\frac{\pi}{2} + 2\sqrt{3\pi}\right) e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}$$

Series representations:

- More

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \sum_{k=0}^{\infty} \frac{2^{1+2k}\, e^{-2\left(1+\sqrt{3}\right)\sqrt{\pi}} \left(3^{1/2+k} - e^{2\sqrt{3\pi}}\right)(-\pi)^{1+k}}{(1+2k)!}$$

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$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \sum_{k=0}^{\infty} \frac{2^{1+2k}\, e^{-2\left(1+\sqrt{3}\right)\sqrt{\pi} + i k \pi} \left(-3^{1/2+k} + e^{2\sqrt{3\pi}}\right)\pi^{1+k}}{(1+2k)!}$$

Open code

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \sum_{k=0}^{\infty} \left(\frac{(-1)^k\, 2^{1+2k}\, e^{-2\sqrt{\pi}}\, \pi^{1/2+1/2(1+2k)}}{(1+2k)!} + \frac{(-1)^{1+k}\, 2^{1+2k} \times 3^{1/2(1+2k)}\, e^{-2\sqrt{\pi}-2\sqrt{3\pi}}\, \pi^{1/2+1/2(1+2k)}}{(1+2k)!}\right)$$

Integral representations:

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \int_0^1 \left(2 e^{-2\sqrt{\pi}}\, \pi \cos\left(2\sqrt{\pi}\, t\right) - 2\sqrt{3}\, e^{-2\sqrt{\pi} - 2\sqrt{3\pi}}\, \pi \cos\left(2\sqrt{3\pi}\, t\right)\right) dt$$

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$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \int_{-i\infty+\gamma}^{i\infty+\gamma} \left(-\frac{i\, e^{-2\sqrt{\pi} - \pi/s + s} \sqrt{\pi}}{2\, s^{3/2}} + \frac{i\, e^{-2\sqrt{\pi} - 2\sqrt{3\pi} - (3\pi)/s + s} \sqrt{3\pi}}{2\, s^{3/2}}\right) ds \quad \text{for } \gamma > 0$$

Open code

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \int_{-i\infty+\gamma}^{i\infty+\gamma} \left(-\frac{i\, e^{-2\sqrt{\pi}}\, \pi^{1/2(1-2s)}\, \Gamma(s)}{2\, \Gamma\left(\frac{3}{2} - s\right)} + \frac{i\, e^{-2\sqrt{\pi} - 2\sqrt{3\pi}}\, (3\pi)^{1/2(1-2s)}\, \Gamma(s)}{2\, \Gamma\left(\frac{3}{2} - s\right)}\right) ds \quad \text{for } 0 < \gamma < 1$$

Open code

- $\Gamma(x)$ is the gamma function

Multiple-argument formulas:

More

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = e^{-2\sqrt{\pi}} \sqrt{\pi} \left(2\cos\left(\sqrt{\pi}\right) \sin\left(\sqrt{\pi}\right) - 2 e^{-2\sqrt{3\pi}} \cos\left(\sqrt{3\pi}\right) \sin\left(\sqrt{3\pi}\right)\right)$$

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$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \prod_{k=0}^{1} -2 e^{-2\left(1+\sqrt{3}\right)\sqrt{\pi}} \sqrt{\pi} \left(-e^{2\sqrt{3\pi}} \sin\left(\sqrt{\pi} + \frac{k\pi}{2}\right) + \sin\left(\frac{k\pi}{2} + \sqrt{3\pi}\right)\right)$$

Open code

$$\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right) = \prod_{k=0}^{1} \left(2 e^{-2\sqrt{\pi}} \sqrt{\pi} \sin\left(\sqrt{\pi} + \frac{k\pi}{2}\right) - 2 e^{-2\sqrt{\pi} - 2\sqrt{3\pi}} \sqrt{\pi} \sin\left(\frac{k\pi}{2} + \sqrt{3\pi}\right)\right)$$

The inverse of the expression is:

1 / ((((((((sqrt(Pi) * ((((e^((-2sqrt(Pi))) * (((((sin ((2sqrt(Pi)))) - ((((e^((-2sqrt(3Pi))) * (((((sin ((2sqrt(3Pi))))))))))))

Input:

$$\frac{1}{\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)}$$

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Exact result:

$$\frac{e^{2\sqrt{\pi}}}{\sqrt{\pi}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)}$$

Decimal approximation:

- More digits

−49.8302942114019159581012768892254786959950378932234568014...

Alternate forms:

- More

$$-\frac{e^{2\sqrt{\pi}}}{\sqrt{\pi}\left(e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)-\sin\left(2\sqrt{\pi}\right)\right)}$$

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$$\frac{e^{2\sqrt{\pi}+2\sqrt{3\pi}}}{\sqrt{\pi}\left(e^{2\sqrt{3\pi}}\sin\left(2\sqrt{\pi}\right)-\sin\left(2\sqrt{3\pi}\right)\right)}$$

Open code

$$\frac{e^{2\sqrt{\pi}+2\sqrt{3\pi}}}{2e^{2\sqrt{3\pi}}\sqrt{\pi}\sin\left(\sqrt{\pi}\right)\cos\left(\sqrt{\pi}\right)-2\sqrt{\pi}\sin\left(\sqrt{3\pi}\right)\cos\left(\sqrt{3\pi}\right)}$$

Open code

Continued fraction:

- Linear form

$$-49+\cfrac{1}{-1+\cfrac{1}{-4+\cfrac{1}{-1+\cfrac{1}{-8+\cfrac{1}{-3+\cfrac{1}{-3+\cfrac{1}{-1+\cfrac{1}{-5+\cfrac{1}{-2+\cfrac{1}{-2+\cfrac{1}{-15+\cfrac{1}{-15+\cfrac{1}{-1+\cfrac{1}{-6+\cfrac{1}{\ldots}}}}}}}}}}}}}}}$$

Alternative representations:

- More

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{1}{e^{-2\sqrt{\pi}} \left(\frac{1}{\csc\left(2\sqrt{\pi}\right)} - \frac{e^{-2\sqrt{3\pi}}}{\csc\left(2\sqrt{3\pi}\right)}\right) \sqrt{\pi}}$$

Open code

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$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{1}{e^{-2\sqrt{\pi}} \left(\cos\left(\frac{\pi}{2} - 2\sqrt{\pi}\right) - \cos\left(\frac{\pi}{2} - 2\sqrt{3\pi}\right) e^{-2\sqrt{3\pi}}\right) \sqrt{\pi}}$$

Open code

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{1}{e^{-2\sqrt{\pi}} \left(-\cos\left(\frac{\pi}{2} + 2\sqrt{\pi}\right) + \cos\left(\frac{\pi}{2} + 2\sqrt{3\pi}\right) e^{-2\sqrt{3\pi}}\right) \sqrt{\pi}}$$

Series representations:

- More

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\left(1+\sqrt{3}\right)\sqrt{\pi}}}{\sqrt{\pi} \sum_{k=0}^{\infty} \frac{(-1)^{1+k}\, 2^{1+2k} \left(3^{1/2+k} - e^{2\sqrt{3\pi}}\right) \pi^{1/2+k}}{(1+2k)!}}$$

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$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \sum_{k=0}^{\infty} \frac{(-1)^{k}\, 2^{1+2k}\, e^{-2\sqrt{3\pi}} \left(-3^{1/2+k} + e^{2\sqrt{3\pi}}\right) \pi^{1/2+k}}{(1+2k)!}}$$

Open code

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \sum_{k=0}^{\infty} \frac{(-1)^k \left(\left(2\sqrt{\pi} - \frac{\pi}{2}\right)^{2k} - e^{-2\sqrt{3\pi}} \left(-\frac{\pi}{2} + 2\sqrt{3\pi}\right)^{2k}\right)}{(2k)!}}$$

Integral representations:

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \int_0^1 \left(2\sqrt{\pi} \cos\left(2\sqrt{\pi}\, t\right) - 2 e^{-2\sqrt{3\pi}} \sqrt{3\pi} \cos\left(2\sqrt{3\pi}\, t\right)\right) dt}$$

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$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \int_{-i\infty+\gamma}^{i\infty+\gamma} \left(\frac{i\sqrt{3}\, e^{-2\sqrt{3\pi} - (3\pi)/s + s}}{2 s^{3/2}} - \frac{i\, e^{-\pi/s+s}}{2 s^{3/2}}\right) ds} \quad \text{for } \gamma > 0$$

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$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{i\, e^{-2\sqrt{3\pi}} \left(\sqrt{3} - 3^s e^{2\sqrt{3\pi}}\right) (3\pi)^{-s}\, \Gamma(s)}{2\, \Gamma\left(\frac{3}{2} - s\right)} ds} \quad \text{for } 0 < \gamma < 1$$

Multiple-argument formulas:

- More

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin\left(2\sqrt{\pi}\right) - e^{-2\sqrt{3\pi}} \sin\left(2\sqrt{3\pi}\right)\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \left(2\cos\left(\sqrt{\pi}\right) \sin\left(\sqrt{\pi}\right) - 2 e^{-2\sqrt{3\pi}} \cos\left(\sqrt{3\pi}\right) \sin\left(\sqrt{3\pi}\right)\right)}$$

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$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}} \sin(2\sqrt{3\pi})\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \prod_{k=0}^{1} \left(2\sin\left(\sqrt{\pi} + \frac{k\pi}{2}\right) - 2e^{-2\sqrt{3\pi}} \sin\left(\frac{k\pi}{2} + \sqrt{3\pi}\right)\right)}$$

Open code

$$\frac{1}{\sqrt{\pi}\, e^{-2\sqrt{\pi}} \left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}} \sin(2\sqrt{3\pi})\right)} = \frac{e^{2\sqrt{\pi}}}{\sqrt{\pi} \left(-e^{-2\sqrt{3\pi}} \left(3\sin\left(2\sqrt{\frac{\pi}{3}}\right) - 4\sin^3\left(2\sqrt{\frac{\pi}{3}}\right)\right) + 3\sin\left(\frac{2\sqrt{\pi}}{3}\right) - 4\sin^3\left(\frac{2\sqrt{\pi}}{3}\right)\right)}$$

(89+55+21+8)/5 * 1 / ((((((((sqrt(Pi) * ((((e^((-2sqrt(Pi))) * (((((sin ((2sqrt(Pi)))) - ((((e^((-2sqrt(3Pi))) * (((((sin ((2sqrt(3Pi)))))))))))))

Input:

$$\left(\frac{1}{5}(89+55+21+8)\right) \times \frac{1}{\sqrt{\pi} \left(e^{-2\sqrt{\pi}} \left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}} \sin(2\sqrt{3\pi})\right)\right)}$$

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Exact result:

$$\frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi} \left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}} \sin(2\sqrt{3\pi})\right)}$$

Decimal approximation:

- More digits

$-1724.128179714506292150304180367201562881428311105531605 32...$

1724.1281797145062921503041803672015628814283111055316053 29

Alternate forms:

- More

$$-\frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi} \left(e^{-2\sqrt{3\pi}} \sin(2\sqrt{3\pi}) - \sin(2\sqrt{\pi})\right)}$$

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$$\frac{173\, e^{2\sqrt{\pi}+2\sqrt{3\pi}}}{5\sqrt{\pi} \left(e^{2\sqrt{3\pi}} \sin(2\sqrt{\pi}) - \sin(2\sqrt{3\pi})\right)}$$

Open code

$$\frac{173\,e^{2\sqrt{\pi}+2\sqrt{3\pi}}}{10\,e^{2\sqrt{3\pi}}\sqrt{\pi}\,\sin(\sqrt{\pi})\cos(\sqrt{\pi}) - 10\sqrt{\pi}\,\sin(\sqrt{3\pi})\cos(\sqrt{3\pi})}$$

Continued fraction:

- Linear form

$$-1724 + \cfrac{1}{-7 + \cfrac{1}{-1 + \cfrac{1}{-4 + \cfrac{1}{-25 + \cfrac{1}{-1 + \cfrac{1}{-1 + \cfrac{1}{-1 + \cfrac{1}{-78 + \cfrac{1}{-5 + \cfrac{1}{-5 + \cfrac{1}{-2 + \cfrac{1}{-1 + \cfrac{1}{-4 + \cfrac{1}{-5 + \cfrac{1}{\ldots}}}}}}}}}}}}}}}$$

Alternative representations:

- More

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173}{5\left(e^{-2\sqrt{\pi}}\left(\frac{1}{\csc(2\sqrt{\pi})} - \frac{e^{-2\sqrt{3\pi}}}{\csc(2\sqrt{3\pi})}\right)\sqrt{\pi}\right)}$$

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$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173}{5\left(e^{-2\sqrt{\pi}}\left(\cos\left(\frac{\pi}{2} - 2\sqrt{\pi}\right) - \cos\left(\frac{\pi}{2} - 2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Open code

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi}) - e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173}{5\left(e^{-2\sqrt{\pi}}\left(-\cos\left(\frac{\pi}{2} + 2\sqrt{\pi}\right) + \cos\left(\frac{\pi}{2} + 2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Series representations:

- More

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\, e^{2\left(1+\sqrt{3}\right)\sqrt{\pi}}}{5\sqrt{\pi}\sum_{k=0}^{\infty}\frac{(-1)^{1+k}\,2^{1+2k}\left(3^{1/2+k}-e^{2\sqrt{3\pi}}\right)\pi^{1/2+k}}{(1+2k)!}}$$

Open code

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$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\sum_{k=0}^{\infty}\frac{(-1)^{k}\,2^{1+2k}\,e^{-2\sqrt{3\pi}}\left(-3^{1/2+k}+e^{2\sqrt{3\pi}}\right)\pi^{1/2+k}}{(1+2k)!}}$$

Open code

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(\left(2\sqrt{\pi}-\frac{\pi}{2}\right)^{2k}-e^{-2\sqrt{3\pi}}\left(-\frac{\pi}{2}+2\sqrt{3\pi}\right)^{2k}\right)}{(2k)!}}$$

Integral representations:

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\int_0^1\left(2\sqrt{\pi}\cos(2\sqrt{\pi}\,t)-2\,e^{-2\sqrt{3\pi}}\sqrt{3\pi}\cos(2\sqrt{3\pi}\,t)\right)dt}$$

Open code

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$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\left(\frac{i\sqrt{3}\,e^{-2\sqrt{3\pi}-(3\pi)/s+s}}{2\,s^{3/2}}-\frac{i\,e^{-\pi/s+s}}{2\,s^{3/2}}\right)ds} \quad \text{for } \gamma > 0$$

Open code

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{i\,e^{-2\sqrt{3\pi}}\left(\sqrt{3}-3^s\,e^{2\sqrt{3\pi}}\right)(3\pi)^{-s}\,\Gamma(s)}{2\,\Gamma\left(\frac{3}{2}-s\right)}\,ds} \quad \text{for } 0<\gamma<1$$

Multiple-argument formulas:

- More

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\left(2\cos(\sqrt{\pi})\sin(\sqrt{\pi})-2\,e^{-2\sqrt{3\pi}}\cos(\sqrt{3\pi})\sin(\sqrt{3\pi})\right)}$$

Open code

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$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\prod_{k=0}^{1}\left(2\sin\left(\sqrt{\pi}+\frac{k\pi}{2}\right)-2\,e^{-2\sqrt{3\pi}}\sin\left(\frac{k\pi}{2}+\sqrt{3\pi}\right)\right)}$$

Open code

$$\frac{89+55+21+8}{\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)5} = \frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\left(-e^{-2\sqrt{3\pi}}\left(3\sin\left(2\sqrt{\frac{\pi}{3}}\right)-4\sin^3\left(2\sqrt{\frac{\pi}{3}}\right)\right)+3\sin\left(\frac{2\sqrt{\pi}}{3}\right)-4\sin^3\left(\frac{2\sqrt{\pi}}{3}\right)\right)}$$

This result is very near to the mass of candidate glueball $f_0(1710)$ meson.

(1724.128179714506292150304180367201562881428311105531605329)^1/3

Input interpretation:

$$\sqrt[3]{1724.128179714506292150304180367201562881428311105531605329}$$

Open code

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Result:
More digits

- 11.99103075076044025783999047488094862208676261450239724576...

This result is very near to the value of black hole entropy 12,1904

2 * (1724.128179714506292150304180367201562881428311105531605329)^1/3

Input interpretation:

$$2\sqrt[3]{1724.128179714506292150304180367201562881428311105531605329}$$

Open code

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Result:
More digits

- 23.98206150152088051567998094976189724417352522900479449153...

23.98206150152088051567998094976189724417352522900479449153

This value is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

Continued fraction:
Linear form

- $$23+\cfrac{1}{1+\cfrac{1}{54+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{14+\cfrac{1}{1+\cfrac{1}{41+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{3+\cfrac{1}{72+\cfrac{1}{1+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Possible closed forms:
More

- $$\sqrt{\frac{1}{10}\left(-13210-2054\,e+7419\,\pi+1785\log(2)\right)}\approx 23.98206150152088051131513$$

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root of $15x^5 - 370x^4 + 243x^3 + 110x^2 - 735x - 485$ near $x = 23.9821$ ≈ 23.982061501520880516874 6

π root of $6120x^3 - 53094x^2 + 52093x - 26134$ near $x = 7.63373$ ≈ 23.982061501520880514821 5

(1724.1281797145062921503041803672015628814283111055316053 29)^1/15

Input interpretation:

$$\sqrt[15]{1724.128179714506292150304180367201562881428311105531605329}$$

Open code

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Result:

- More digits

1.6435060356892508601078908610804011458989533806972475 29715...

1.643506035689250860107890861080401145898953380697247529715

This value 1,643506 is very near to the golden ratio. It can be defined a golden number.

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{17+\cfrac{1}{6+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{10+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

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Possible closed forms:

- More

root of $556x^3 + 46210x^2 - 72092x - 8803$ near $x = 1.64351$ ≈ 1.643506035689250860123222

$$\frac{738\,751\,665\,\pi}{1\,412\,137\,682} \approx 1.643506035689250860115508$$

$$\frac{-12\,047 - 9244\,e + 5626\,e^2}{984\,e} \approx 1.643506035689250859629$$

(1.643506035689)^(1.1056*12)

Where 1,1056 is the value of Cosmological Constant that is 1,1056 * 10^{-52}

Input interpretation:

$1.643506035689^{1.1056\times 12}$

Open code

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Result:

- Fewer digits
- More digits

728.92196243255434422892442895419207109746772229348737739530...

728.92196243255434422892442895419207109746772229348737 ≈ 729

Where 729 regard the following Ramanujan expression $6^3 + 8^3 = 9^3 - 1 = 728$

Continued fraction:

- Linear form

$$728 + \cfrac{1}{1 + \cfrac{1}{11 + \cfrac{1}{1 + \cfrac{1}{4 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{3 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{13 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{3 + \cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

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Possible closed forms:

- More

$$\frac{2\left(223 + 380\sqrt{\pi} + 680\,\pi - 296\,\pi^{3/2} + 2760\,\pi^2\right)}{25\,\pi} \approx 728.92196243255434422295864$$

$$-\frac{22\,217}{5} - \frac{39\,271}{13\,\pi} + \frac{126\,911\,\pi}{65} \approx 728.921962432554344257449$$

root of $3x^5 - 2186x^4 - 555x^3 - 2382x^2 - 2250x + 848$ near $x = 728.922$ ≈
728.92196243255434422228459

Note that:

(1.643506035689)^(1.1056*12)+16

Input interpretation:

$1.643506035689^{1.1056\times 12} + 16$

Open code

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Result:

- Fewer digits
- More digits

744.9219624325543442289244289541920710974677222934873739530...

744.92196243255434422892442895419207109746772229348737

Where 744,9219 is very near to the number 744 of the Laurent series in terms of q.

We also obtain:

(1.643506035689)^(1.1056*12)+27*2

Input interpretation:

$1.643506035689^{1.1056\times 12} + 27\times 2$

Open code

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Result:

- Fewer digits
- More digits

782.9219624325543442289244289541920710974677222934873739530...

782.92196243255434422892442895419207109746772229348737

Continued fraction:

- Linear form

$$782+\cfrac{1}{1+\cfrac{1}{11+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{3+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{13+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

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Possible closed forms:

- More

$$\frac{1}{3}\left(48 e^{\pi}+1693\pi-991\log(\pi)-2760\log(2\pi)+1684\tan^{-1}(\pi)\right)\approx 782.92196243255434436311$$

$$-\frac{21947}{5}-\frac{39271}{13\pi}+\frac{126911\pi}{65}\approx 782.92196243255434425 7449$$

$$\frac{1566\pi\pi!+5983-5798\pi+33792\pi^2}{145\pi}\approx 782.92196243255434423 0350$$

-

This result 782,92 is very near to the rest mass of Omega meson 782.65±0.12

Now:

-(1/12.57) * ((89+55+21+8)/5)) * 1/ (((((((sqrt(Pi) * ((((e^((-2sqrt(Pi))) * (((((sin ((2sqrt(Pi)))) - ((((e^((-2sqrt(3Pi))) * (((((sin ((2sqrt(3Pi))))))))))

where 12,57 is the value of black hole entropy 12.5664 ≈ 12,57

Input:

$$-\frac{1}{12.57}\left(\left(\frac{1}{5}(89+55+21+8)\right)\times\frac{1}{\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)}\right)$$

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Result:

- Fewer digits

- More digits
  137.1621463575581775775898313736834974448232546623334610445...

Alternative representations:

- More

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$

$$-\frac{173}{5\times 12.57\left(e^{-2\sqrt{\pi}}\left(\frac{1}{\csc\left(2\sqrt{\pi}\right)}-\frac{e^{-2\sqrt{3\pi}}}{\csc\left(2\sqrt{3\pi}\right)}\right)\sqrt{\pi}\right)}$$

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$

$$-\frac{173}{5\times 12.57\left(e^{-2\sqrt{\pi}}\left(\cos\left(\frac{\pi}{2}-2\sqrt{\pi}\right)-\cos\left(\frac{\pi}{2}-2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$

$$-\frac{173}{5\times 12.57\left(e^{-2\sqrt{\pi}}\left(-\cos\left(\frac{\pi}{2}+2\sqrt{\pi}\right)+\cos\left(\frac{\pi}{2}+2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Series representations:

- More

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$

$$-\left(\left(1.37629\exp\left(2\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}+2\sqrt{-1+3\pi}\sum_{k=0}^{\infty}(-1+3\pi)^{-k}\binom{\frac{1}{2}}{k}\right)\right)\right)\Big/$$
$$\left(\sqrt{-1+\pi}\left(\exp\left(2\sqrt{-1+3\pi}\sum_{k=0}^{\infty}(-1+3\pi)^{-k}\binom{\frac{1}{2}}{k}\right)\sum_{k=0}^{\infty}(-1)^k J_{1+2k}\left(2\sqrt{\pi}\right)-\right.\right.$$
$$\left.\left.\sum_{k=0}^{\infty}(-1)^k J_{1+2k}\left(2\sqrt{3\pi}\right)\right)\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}\right)\right)$$

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)12.57}=$$

$$-\left(\left(1.37629\exp\left(2\exp\left(i\pi\left\lfloor\frac{\arg(\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\right.\right.\right.$$
$$\left.\left.2\exp\left(i\pi\left\lfloor\frac{\arg(3\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Big/$$
$$\left(\exp\left(i\pi\left\lfloor\frac{\arg(\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\right.$$
$$\left(\exp\left(2\exp\left(i\pi\left\lfloor\frac{\arg(3\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right.$$
$$\left.\sum_{k=0}^{\infty}(-1)^k J_{1+2k}\left(2\sqrt{\pi}\right)-\sum_{k=0}^{\infty}(-1)^k J_{1+2k}\left(2\sqrt{3\pi}\right)\right)$$
$$\left.\left.\sum_{k=0}^{\infty}\frac{(-1)^k(\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\quad\text{for }(x\in\mathbb{R}\text{ and }x<0)$$

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)12.57}=$$

$$-\left(\left(2.75259\exp\left(2\exp\left(i\pi\left\lfloor\frac{\arg(\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\right.\right.\right.$$
$$\left.\left.2\exp\left(i\pi\left\lfloor\frac{\arg(3\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Big/$$
$$\left(\exp\left(i\pi\left\lfloor\frac{\arg(\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right.$$
$$\left(\exp\left(2\exp\left(i\pi\left\lfloor\frac{\arg(3\pi-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3\pi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right.$$
$$\sum_{k=0}^{\infty}\frac{(-1)^k 2^{1+2k}\sqrt{\pi}^{1+2k}}{(1+2k)!}-$$
$$\left.\left.\left.\sum_{k=0}^{\infty}\frac{(-1)^k 2^{1+2k}\sqrt{3\pi}^{1+2k}}{(1+2k)!}\right)\right)\right)\quad\text{for }(x\in\mathbb{R}\text{ and }x<0)$$

Integral representations:

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$
$$-\frac{2.75259\,e^{2\sqrt{\pi}}}{\sqrt{\pi}\int_0^1\left(2\cos\left(2t\sqrt{\pi}\right)\sqrt{\pi}-2e^{-2\sqrt{3\pi}}\cos\left(2t\sqrt{3\pi}\right)\sqrt{3\pi}\right)dt}$$

Open code

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$
$$-\frac{5.50517\,e^{2\left(\sqrt{\pi}+\sqrt{3\pi}\right)}\,i\pi}{\sqrt{\pi}^2\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{2\sqrt{3\pi}}\,\mathcal{A}^{s-\sqrt{\pi}^2/s}\sqrt{\pi}-\mathcal{A}^{s-\sqrt{3\pi}^2/s}\sqrt{3\pi}}{s^{3/2}}\,ds}\quad\text{for }\gamma>0$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$
$$-\frac{5.50517\,e^{2\left(\sqrt{\pi}+\sqrt{3\pi}\right)}\,i\pi}{\sqrt{\pi}^2\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\Gamma(s)\left(e^{2\sqrt{3\pi}}\sqrt{\pi}^{1-2s}-\sqrt{3\pi}^{1-2s}\right)}{\Gamma\left(\frac{3}{2}-s\right)}\,ds}\quad\text{for }0<\gamma<1$$

Multiple-argument formulas:

- More

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$
$$-\frac{2.75259\,e^{2\sqrt{\pi}}}{\left(2\cos\left(\sqrt{\pi}\right)\sin\left(\sqrt{\pi}\right)-2e^{-2\sqrt{3\pi}}\cos\left(\sqrt{3\pi}\right)\sin\left(\sqrt{3\pi}\right)\right)\sqrt{\pi}}$$

Open code

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)12.57}=$$
$$-\frac{2.75259\,e^{2\sqrt{\pi}}}{\left(2\cos\left(\sqrt{\pi}\right)\sin\left(\sqrt{\pi}\right)-2e^{-2\sqrt{3}\sqrt{\pi}}\cos\left(\sqrt{3\pi}\right)\sin\left(\sqrt{3\pi}\right)\right)\sqrt{\pi}}$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)12.57} =$$

$$-\frac{2.75259\,e^{2\sqrt{\pi}}}{\left(3\sin\left(\frac{2\sqrt{\pi}}{3}\right)-4\sin^3\left(\frac{2\sqrt{\pi}}{3}\right)+e^{-2\sqrt{3}\sqrt{\pi}}\sin\left(\frac{2\sqrt{3\pi}}{3}\right)\left(-3+4\sin^2\left(\frac{2\sqrt{3\pi}}{3}\right)\right)\right)\sqrt{\pi}}$$

This result 137,1621 is very near to the mass of the Pions $\pi^{\pm}$: 139.57018(35) MeV/c^2 π^0:134.9766(6) MeV/c^2 and to the inverse of fine-structure constant α that is 137.035999084(21).

Also for the exact value of black hole entropy, 12,5664, we obtain a similar result:

Input interpretation:

$$-\frac{1}{12.5664}\left(\left(\frac{1}{5}(89+55+21+8)\right)\times\frac{1}{\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)}\right)$$

Open code

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Result:

- Fewer digits
- More digits

137.2014403261480051685688964514261493252982804228364213561...

137.20144032614800516856889645142614932529828042283642

Continued fraction:

- Linear form

$$137+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{26+\cfrac{1}{1+\cfrac{1}{34+\cfrac{1}{13+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{5+\cfrac{1}{12+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\sqrt{\frac{1}{3}(-5640+21513e+2741\pi-7180\log(2))} \approx 137.20144032614800516 93804$$

$$\frac{-840+1405\sqrt{\pi}+2055\pi-1334\pi^{3/2}+237\pi^2}{7\pi} \approx 137.20144032614800516 71739$$

$$-26+24e+41e^2+89\sqrt{1+e}-12\sqrt{1+e^2}-52\pi+6\pi^2+29\sqrt{1+\pi}-90\sqrt{1+\pi^2} \approx 137.20144032614800516 828034$$

For the value of the black hole entropy 12,1904 (that is ln 196884), we obtain:

-(1/(ln 196884)) * ((89+55+21+8)/5)) * 1/ (((((((sqrt(Pi) * ((((e^((-2sqrt(Pi))) * (((((sin ((2sqrt(Pi)))) - ((((e^((-2sqrt(3Pi))) * (((((sin ((2sqrt(3Pi))))))))

Input:

$$-\frac{1}{\log(196884)}\left(\left(\frac{1}{5}(89+55+21+8)\right)\times\frac{1}{\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)}\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$-\frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\log(196884)\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)}$$

Decimal approximation:

- More digits

141.433621740727972814007952248847970059738914516928629615 7...

This result 141.433 is very near to the mass of the Pions $\pi^{\pm}$: 139.57018(35) MeV/c^2

π^0 :134.9766(6) MeV/c^2

Alternate forms:

- More

$$-\frac{173\,e^{2\sqrt{\pi}+2\sqrt{3\pi}}}{5\sqrt{\pi}\log(196884)\left(e^{2\sqrt{3\pi}}\sin\left(2\sqrt{\pi}\right)-\sin\left(2\sqrt{3\pi}\right)\right)}$$

Open code

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$$\frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\,(2\log(2)+3\log(3)+\log(1823))\left(e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)-\sin\left(2\sqrt{\pi}\right)\right)}$$

$$-\left(\left(173\,e^{2\sqrt{\pi}+2\sqrt{3\pi}}\right)\Big/\left(10\,e^{2\sqrt{3\pi}}\sqrt{\pi}\log(196884)\sin\left(\sqrt{\pi}\right)\cos\left(\sqrt{\pi}\right)-10\sqrt{\pi}\log(196884)\sin\left(\sqrt{3\pi}\right)\cos\left(\sqrt{3\pi}\right)\right)\right)$$

Open code

Continued fraction:

- Linear form

$$141+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{11+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{9+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Alternative representations:

- More

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)\log(196\,884)}=$$

$$-\frac{173}{5\log(196\,884)\left(e^{-2\sqrt{\pi}}\left(\cos\left(\frac{\pi}{2}-2\sqrt{\pi}\right)-\cos\left(\frac{\pi}{2}-2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Open code

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)\log(196\,884)}=$$

$$-\frac{173}{5\log_e(196\,884)\left(e^{-2\sqrt{\pi}}\left(\cos\left(\frac{\pi}{2}-2\sqrt{\pi}\right)-\cos\left(\frac{\pi}{2}-2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin\left(2\sqrt{\pi}\right)-e^{-2\sqrt{3\pi}}\sin\left(2\sqrt{3\pi}\right)\right)\right)\right)\right)\log(196\,884)}=$$

$$-\frac{173}{5\log_e(196\,884)\left(e^{-2\sqrt{\pi}}\left(-\cos\left(\frac{\pi}{2}+2\sqrt{\pi}\right)+\cos\left(\frac{\pi}{2}+2\sqrt{3\pi}\right)e^{-2\sqrt{3\pi}}\right)\sqrt{\pi}\right)}$$

Open code

Series representations:

More

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\frac{173\,e^{2\left(1+\sqrt{3}\right)\sqrt{\pi}}}{5\sqrt{\pi}\left(\log(196883)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{196883}\right)^k}{k}\right)\sum_{k=0}^{\infty}\frac{(-1)^{1+k}\,2^{1+2k}\left(3^{1/2+k}-e^{2\sqrt{3\pi}}\right)\pi^{1/2+k}}{(1+2k)!}}$$

Open code

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\left(\left(173\,e^{2\sqrt{\pi}}\right)\Big/\left(5\sqrt{\pi}\left(\log(196883)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{196883}\right)^k}{k}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\,2^{1+2k}\,e^{-2\sqrt{3\pi}}\left(-3^{1/2+k}+e^{2\sqrt{3\pi}}\right)\pi^{1/2+k}}{(1+2k)!}\right)\right)$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\left(\left(173\,e^{2\sqrt{\pi}}\right)\Big/\left(5\sqrt{\pi}\left(\log(196883)-\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{196883}\right)^k}{k}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(\left(2\sqrt{\pi}-\frac{\pi}{2}\right)^{2k}-e^{-2\sqrt{3\pi}}\left(-\frac{\pi}{2}+2\sqrt{3\pi}\right)^{2k}\right)}{(2k)!}\right)\right)$$

Open code

Integral representations:

More

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\frac{173\,e^{2\left(1+\sqrt{3}\right)\sqrt{\pi}}}{10\pi\log(196884)\int_0^1\left(e^{2\sqrt{3\pi}}\cos(2\sqrt{\pi}\,t)-\sqrt{3}\cos(2\sqrt{3\pi}\,t)\right)dt}$$

Open code

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = \frac{346\, i\, e^{2(1+\sqrt{3})\sqrt{\pi}}}{5\sqrt{\pi}\log(196884)\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-(3\pi)/s+s}\left(\sqrt{3}-e^{2\left(\sqrt{3\pi}+\pi/s\right)}\right)}{s^{3/2}}\,ds} \quad \text{for } \gamma>0$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\left(\int_1^{196884}\frac{1}{t}\,dt\right)\int_0^1\left(2\sqrt{\pi}\cos(2\sqrt{\pi}\,t)-2e^{-2\sqrt{3\pi}}\sqrt{3\pi}\cos(2\sqrt{3\pi}\,t)\right)dt}$$

Open code

Multiple-argument formulas:

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\log(196884)\left(2\cos(\sqrt{\pi})\sin(\sqrt{\pi})-2e^{-2\sqrt{3\pi}}\cos(\sqrt{3\pi})\sin(\sqrt{3\pi})\right)}$$

Open code

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$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\frac{173\, e^{2\sqrt{\pi}}}{5\sqrt{\pi}\log(196884)\prod_{k=0}^{1}\left(2\sin\left(\sqrt{\pi}+\frac{k\pi}{2}\right)-2e^{-2\sqrt{3\pi}}\sin\left(\frac{k\pi}{2}+\sqrt{3\pi}\right)\right)}$$

Open code

$$-\frac{89+55+21+8}{\left(5\left(\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)\right)\right)\log(196884)} = -\left(\left(173\, e^{2\sqrt{\pi}}\right)\Big/\left(5\sqrt{\pi}\log(196884)\left(-e^{-2\sqrt{3\pi}}\left(3\sin\left(2\sqrt{\frac{\pi}{3}}\right)-4\sin^3\left(2\sqrt{\frac{\pi}{3}}\right)\right)+3\sin\left(\frac{2\sqrt{\pi}}{3}\right)-4\sin^3\left(\frac{2\sqrt{\pi}}{3}\right)\right)\right)\right)$$

Open code

We have in conclusion, that:

Input:

$$\left(-\frac{1}{5}(89+55+21+8)\right)\times\frac{1}{\sqrt{\pi}\left(e^{-2\sqrt{\pi}}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)\right)}$$

Open code

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Exact result:

$$-\frac{173\,e^{2\sqrt{\pi}}}{5\sqrt{\pi}\left(\sin(2\sqrt{\pi})-e^{-2\sqrt{3\pi}}\sin(2\sqrt{3\pi})\right)}$$

Decimal approximation:

- More digits
  1724.128179714506292150304180367201562881428311105531605329...

This result is very near to the mass of candidate glueball $f_0(1710)$ meson

1/3 * (1724.128179714506292150304180367201562881428311105531605329)^1/3

Input interpretation:

$$\frac{1}{3}\sqrt[3]{1724.128179714506292150304180367201562881428311105531605329}$$

Open code

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Result:

- More digits
  3.997010250253480085946663491626982874028920871500799081923...

3.997010250253480085946.....

This result 3,997... is in the range of the mass of DM particle that is between 4 – 4.2 eV

And

1/(1.2108*2) * (1724.12817971450629215)^1/3

where 1.2108 is a Hausdorff dimension that is equal to:

$$2\log_2\left(\frac{\sqrt[3]{27-3\sqrt{78}}+\sqrt[3]{27+3\sqrt{78}}}{3}\right),$$

or root of $2^x - 1 = 2^{(2-x)/2}$

Input interpretation:

$$\frac{1}{1.2108\times 2}\sqrt[3]{1724.12817971450629215}$$

Open code

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Result:

- Fewer digits
- More digits

4.951697535001833604988142261276089597423945264426437822289...

4.95169753500183360498814226127608959742394526442643 78

Continued fraction:

- Linear form

$$4+\cfrac{1}{1+\cfrac{1}{19+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{3+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{20+\cfrac{1}{1+\cfrac{1}{72+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{416+210e+385e^2}{4(99+13e+8e^2)} \approx 4.95169753500183360 69626$$

$$\frac{8962780141\pi}{5686414416} \approx 4.95169753500183360 50147$$

π root of $4215x^4-7500x^3+2700x^2-1446x-1075$ near $x=1.57617$ ≈

4.9516975350018336049 91272

This value 4,95169 is practically equal to the first value of upper bound dark photon energy range ($1.8 * 10^{15} – 4.95 * 10^{16} – 5.4 * 10^{16}$) (Physics Letters B 731 (2014) 265–271 - **Searching a dark photon with HADES**)

Now, we have, from the eq. (8) of the above manuscript:

[(((1^8 /((e^Pi - e^(-Pi))^2))) + (((2^8 / ((e^(2Pi) - e^(-2Pi))^2))) + (((3^8 / ((e^(3Pi) - e^(-3Pi))^2)))]

Input:

$$\frac{1^8}{(e^\pi - e^{-\pi})^2} + \left(\frac{2^8}{(e^{2\pi} - e^{-2\pi})^2} + \frac{3^8}{(e^{3\pi} - e^{-3\pi})^2}\right)$$

Open code

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Exact result:

$$\frac{1}{(e^\pi - e^{-\pi})^2} + \frac{256}{(e^{2\pi} - e^{-2\pi})^2} + \frac{6561}{(e^{3\pi} - e^{-3\pi})^2}$$

Decimal approximation:

- More digits

0.002809930808937306309182947416578584400591312349800616433...

Open code

Property:

$$\frac{1}{(-e^{-\pi} + e^\pi)^2} + \frac{256}{(-e^{-2\pi} + e^{2\pi})^2} + \frac{6561}{(-e^{-3\pi} + e^{3\pi})^2} \text{ is a transcendental number}$$

Alternate forms:

- More

$$\frac{6950 + 7081\cosh(2\pi) + 260\cosh(4\pi) + \cosh(6\pi)}{2(\sinh(2\pi) + \sinh(4\pi))^2}$$

Open code

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$$\frac{1}{(e^{-\pi} - e^\pi)^2} + \frac{256\, e^{4\pi}}{(e^{4\pi} - 1)^2} + \frac{6561\, e^{6\pi}}{(e^{6\pi} - 1)^2}$$

Open code

$$\frac{1}{64}\left(27272 + e^{-10\pi} + 256\, e^{-8\pi} + 6047\, e^{-6\pi} - 12868\, e^{-4\pi} - 7072\, e^{-2\pi} - 7072\, e^{2\pi} - 12868\, e^{4\pi} + 6047\, e^{6\pi} + 256\, e^{8\pi} + e^{10\pi}\right)\operatorname{csch}^2(\pi)\operatorname{csch}^2(2\pi)\operatorname{csch}^2(3\pi)$$

Alternative representations:

- More

$$\frac{1^8}{(e^\pi - e^{-\pi})^2} + \left(\frac{2^8}{(e^{2\pi} - e^{-2\pi})^2} + \frac{3^8}{(e^{3\pi} - e^{-3\pi})^2}\right) = \frac{1^8}{(-e^{-180^\circ} + e^{180^\circ})^2} + \frac{2^8}{(-e^{-360^\circ} + e^{360^\circ})^2} + \frac{3^8}{(-e^{-540^\circ} + e^{540^\circ})^2}$$

Open code

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$$\frac{1^8}{(e^\pi - e^{-\pi})^2} + \left(\frac{2^8}{(e^{2\pi} - e^{-2\pi})^2} + \frac{3^8}{(e^{3\pi} - e^{-3\pi})^2}\right) = \frac{1^8}{(\exp^\pi(z) - \exp^{-\pi}(z))^2} + \left(\frac{2^8}{(\exp^{2\pi}(z) - \exp^{-2\pi}(z))^2} + \frac{3^8}{(\exp^{3\pi}(z) - \exp^{-3\pi}(z))^2}\right) \text{ for } z = 1$$

Open code

$$\frac{1^8}{(e^\pi - e^{-\pi})^2} + \left(\frac{2^8}{(e^{2\pi} - e^{-2\pi})^2} + \frac{3^8}{(e^{3\pi} - e^{-3\pi})^2}\right) = \frac{1^8}{\left(e^{-i\log(-1)} - e^{i\log(-1)}\right)^2} + \frac{2^8}{\left(e^{-2i\log(-1)} - e^{2i\log(-1)}\right)^2} + \frac{3^8}{\left(e^{-3i\log(-1)} - e^{3i\log(-1)}\right)^2}$$

We have that:

1/ [(((1^8 /((e^Pi - e^(-Pi))^2))) + (((2^8 / ((e^(2Pi) - e^(-2Pi))^2))) + (((3^8 / ((e^(3Pi) - e^(-3Pi))^2)))]

Input:

$$\frac{1}{\frac{1^8}{(e^\pi - e^{-\pi})^2} + \left(\frac{2^8}{(e^{2\pi} - e^{-2\pi})^2} + \frac{3^8}{(e^{3\pi} - e^{-3\pi})^2}\right)}$$

Open code

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Exact result:

$$\frac{1}{\frac{1}{(e^\pi - e^{-\pi})^2} + \frac{256}{(e^{2\pi} - e^{-2\pi})^2} + \frac{6561}{(e^{3\pi} - e^{-3\pi})^2}}$$

Decimal approximation:

- More digits

355.8806490250171392664161612277748667179835090731572058768...

Open code

Property:

$$\frac{1}{\frac{1}{(-e^{-\pi} + e^{\pi})^2} + \frac{256}{(-e^{-2\pi} + e^{2\pi})^2} + \frac{6561}{(-e^{-3\pi} + e^{3\pi})^2}} \text{ is a transcendental number}$$

Alternate forms:

- More

$$\frac{2\,(\sinh(2\pi) + \sinh(4\pi))^2}{6950 + 7081\cosh(2\pi) + 260\cosh(4\pi) + \cosh(6\pi)}$$

Open code

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$$\frac{1}{\frac{1}{(e^{-\pi}-e^{\pi})^2}+\frac{256\,e^{4\pi}}{(e^{4\pi}-1)^2}+\frac{6561\,e^{6\pi}}{(e^{6\pi}-1)^2}}$$

Open code

$$-258+e^{-2\pi}+e^{2\pi}+\frac{e^{2\pi}\left(59\,999+1\,812\,736\,e^{2\pi}+3\,572\,034\,e^{4\pi}+1\,812\,736\,e^{6\pi}+59\,999\,e^{8\pi}\right)}{1+260\,e^{2\pi}+7081\,e^{4\pi}+13\,900\,e^{6\pi}+7081\,e^{8\pi}+260\,e^{10\pi}+e^{12\pi}}$$

Open code

Alternative representations:

- More

$$\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}=\frac{1}{\frac{1^8}{\left(-e^{-180\,°}+e^{180\,°}\right)^2}+\frac{2^8}{\left(-e^{-360\,°}+e^{360\,°}\right)^2}+\frac{3^8}{\left(-e^{-540\,°}+e^{540\,°}\right)^2}}$$

Open code

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$$\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}=\frac{1}{\frac{1^8}{(\exp^{\pi}(z)-\exp^{-\pi}(z))^2}+\left(\frac{2^8}{(\exp^{2\pi}(z)-\exp^{-2\pi}(z))^2}+\frac{3^8}{(\exp^{3\pi}(z)-\exp^{-3\pi}(z))^2}\right)} \text{ for } z=1$$

Open code

$$\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}=\frac{1}{\frac{1^8}{\left(e^{-i\log(-1)}-e^{i\log(-1)}\right)^2}+\frac{2^8}{\left(e^{-2i\log(-1)}-e^{2i\log(-1)}\right)^2}+\frac{3^8}{\left(e^{-3i\log(-1)}-e^{3i\log(-1)}\right)^2}}$$

(((((1/ [(((1^8 /((e^Pi - e^(-Pi))^2))) + (((2^8 / ((e^(2Pi) - e^(-2Pi))^2))) + (((3^8 / ((e^(3Pi) - e^(-3Pi))^2)))])))))^1/12

Input:

$$\frac{1}{\sqrt[12]{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}}$$

Open code

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Exact result:

$$\frac{1}{\sqrt[12]{\frac{1}{(e^{\pi}-e^{-\pi})^2}+\frac{256}{(e^{2\pi}-e^{-2\pi})^2}+\frac{6561}{(e^{3\pi}-e^{-3\pi})^2}}}$$

Decimal approximation:

- More digits

1.6315812200601078552051945498030064828726449270419586722 38...

This value 1,6315812 is very near to the golden ratio. It can be defined a golden number.

Property:

$$\frac{1}{\sqrt[12]{\frac{1}{(-e^{-\pi}+e^{\pi})^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}}}$$ is a transcendental number

Open code

Enlarge Data Customize A Plaintext Interactive

Alternate forms:

- More

$$\sqrt[6]{\sinh(2\pi)+\sinh(4\pi)}\ \sqrt[12]{\frac{2}{6950+7081\cosh(2\pi)+260\cosh(4\pi)+\cosh(6\pi)}}$$

Open code

$$\frac{1}{\sqrt[12]{\frac{1}{(e^{-\pi}-e^{\pi})^2}+\frac{256\,e^{4\pi}}{(e^{4\pi}-1)^2}+\frac{6561\,e^{6\pi}}{(e^{6\pi}-1)^2}}}$$

Open code

$$\frac{e^{-\pi/6}\sqrt[6]{-1-e^{2\pi}+e^{6\pi}+e^{8\pi}}}{\sqrt[12]{1+260\,e^{2\pi}+7081\,e^{4\pi}+13\,900\,e^{6\pi}+7081\,e^{8\pi}+260\,e^{10\pi}+e^{12\pi}}}$$

Alternative representations:

- More

$$\frac{1}{\sqrt[12]{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}} =$$

$$\frac{1}{\sqrt[12]{\frac{1^8}{(-e^{-180^\circ}+e^{180^\circ})^2}+\frac{2^8}{(-e^{-360^\circ}+e^{360^\circ})^2}+\frac{3^8}{(-e^{-540^\circ}+e^{540^\circ})^2}}}$$

Open code

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$$\frac{1}{\sqrt[12]{\frac{1^8}{\left(e^{\pi}-e^{-\pi}\right)^2}+\left(\frac{2^8}{\left(e^{2\pi}-e^{-2\pi}\right)^2}+\frac{3^8}{\left(e^{3\pi}-e^{-3\pi}\right)^2}\right)}} = \frac{1}{\sqrt[12]{\frac{1^8}{\left(\exp^{\pi}(z)-\exp^{-\pi}(z)\right)^2}+\left(\frac{2^8}{\left(\exp^{2\pi}(z)-\exp^{-2\pi}(z)\right)^2}+\frac{3^8}{\left(\exp^{3\pi}(z)-\exp^{-3\pi}(z)\right)^2}\right)}} \text{ for } z = 1$$

Open code

$$\frac{1}{\sqrt[12]{\frac{1^8}{\left(e^{\pi}-e^{-\pi}\right)^2}+\left(\frac{2^8}{\left(e^{2\pi}-e^{-2\pi}\right)^2}+\frac{3^8}{\left(e^{3\pi}-e^{-3\pi}\right)^2}\right)}} = \frac{1}{\sqrt[12]{\frac{1^8}{\left(e^{-i\log(-1)}-e^{i\log(-1)}\right)^2}+\frac{2^8}{\left(e^{-2i\log(-1)}-e^{2i\log(-1)}\right)^2}+\frac{3^8}{\left(e^{-3i\log(-1)}-e^{3i\log(-1)}\right)^2}}}$$

1.631581220060107855205194549803006482872644927041958672238

Continued fraction:

- Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1218+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{8+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{5\left(-84-150\pi+65\pi^2\right)}{451-672\pi+195\pi^2} \approx 1.6315812200601078524934$$

root of $8880x^3 - 18763x^2 + 29762x - 37180$ near $x = 1.63158$ $\approx$

1.6315812200601078551941 1

π root of $2464x^4 - 136x^3 - 1457x^2 + 92x + 185$ near $x = 0.519348$ $\approx$

1.6315812200601078562655

3 * ln (((1/ [((((1^8 /((e^Pi - e^(-Pi))^2))) + (((2^8 / ((e^(2Pi) - e^(-2Pi))^2))) + (((3^8 / ((e^(3Pi) - e^(-3Pi))^2)))])))

Input:

$$3 \log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2} + \left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2} + \frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$-3 \log\left(\frac{1}{(e^{\pi}-e^{-\pi})^2} + \frac{256}{(e^{2\pi}-e^{-2\pi})^2} + \frac{6561}{(e^{3\pi}-e^{-3\pi})^2}\right)$$

Decimal approximation:

- More digits

17.623786257280863021972187431041521198020522170092937887 55...

Open code

Alternate forms:

- More

$$\log(8) + 6 \log(\sinh(2\pi) + \sinh(4\pi)) - 3 \log(6950 + 7081 \cosh(2\pi) + 260 \cosh(4\pi) + \cosh(6\pi))$$

Open code

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$$-3 \log\left(\frac{1}{(e^{-\pi}-e^{\pi})^2} + \frac{256 e^{4\pi}}{(e^{4\pi}-1)^2} + \frac{6561 e^{6\pi}}{(e^{6\pi}-1)^2}\right)$$

Open code

$$-6\pi + 6 \log((e^{2\pi}-1)(1+e^{2\pi})(1+e^{2\pi}+e^{4\pi})) - 3 \log(1 + 260 e^{2\pi} + 7081 e^{4\pi} + 13900 e^{6\pi} + 7081 e^{8\pi} + 260 e^{10\pi} + e^{12\pi})$$

-

Continued fraction:

- Linear form

$$17+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{12+\cfrac{1}{4+\cfrac{1}{38+\cfrac{1}{1+\cfrac{1}{9+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{3+\cfrac{1}{8+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Alternative representations:

- More

$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=$$

$$3\log_e\left(\frac{1}{\frac{1^8}{(-e^{-\pi}+e^{\pi})^2}+\frac{2^8}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{3^8}{(-e^{-3\pi}+e^{3\pi})^2}}\right)$$

Open code

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$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=$$

$$3\log(a)\log_a\left(\frac{1}{\frac{1^8}{(-e^{-\pi}+e^{\pi})^2}+\frac{2^8}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{3^8}{(-e^{-3\pi}+e^{3\pi})^2}}\right)$$

Open code

$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=$$

$$-3\,\text{Li}_1\left(1-\frac{1}{\frac{1^8}{(-e^{-\pi}+e^{\pi})^2}+\frac{2^8}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{3^8}{(-e^{-3\pi}+e^{3\pi})^2}}\right)$$

Series representations:

- More

$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=$$

$$3\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{1}{(e^{-\pi}-e^{\pi})^2}+\frac{256\,e^{4\pi}}{(-1+e^{4\pi})^2}+\frac{6561\,e^{6\pi}}{(-1+e^{6\pi})^2}\right)^k}{k}$$

Open code

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$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=-6\,i\,\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor-$$

$$3\log(z_0)+3\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{1}{(-e^{-\pi}+e^{\pi})^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}-z_0\right)^k z_0^{-k}}{k}$$

Open code

$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=$$

$$-6\,i\,\pi\left\lfloor\frac{\arg\left(\frac{1}{(-e^{-\pi}+e^{\pi})^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}-x\right)}{2\pi}\right\rfloor-3\log(x)+$$

$$3\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{1}{(-e^{-\pi}+e^{\pi})^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}-x\right)^k x^{-k}}{k}\quad\text{for } x<0$$

Integral representation:

$$3\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right) = -3\int_1^{\frac{1}{(e^{-\pi}-e^{\pi})^2}+\frac{256\,e^{4\pi}}{(-1+e^{4\pi})^2}+\frac{6561\,e^{6\pi}}{(-1+e^{6\pi})^2}} \frac{1}{t}\,dt$$

This result 17,6237 is very near to the value of black hole entropy 17,5764

-(((5 + 13^2 - 18^2 * ln (((1/ [((((1^8 /((e^Pi - e^(-Pi))^2))) + (((2^8 / ((e^(2Pi) - e^(-2Pi))^2))) + (((3^8 / ((e^(3Pi) - e^(-3Pi))^2)))])))))

Input:

$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$-174-324\log\left(\frac{1}{(e^{\pi}-e^{-\pi})^2}+\frac{256}{(e^{2\pi}-e^{-2\pi})^2}+\frac{6561}{(e^{3\pi}-e^{-3\pi})^2}\right)$$

Decimal approximation:

- More digits

1729.368915786333206372996242552484289386216394370037291855...

1729.368915786333206372996242552484289386216394370037291855

This result is very near to the mass of candidate glueball $f_0(1710)$ meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. As a consequence, it is sometimes called a Zagier as a pun on the Gross–Zagier theorem. The number 1728 is one less than the Hardy–Ramanujan number 1729

Alternate forms:

- More

$$-6\left(29+54\log\left(\frac{1}{(e^{-\pi}-e^{\pi})^2}+\frac{256\,e^{4\pi}}{(e^{4\pi}-1)^2}+\frac{6561\,e^{6\pi}}{(e^{6\pi}-1)^2}\right)\right)$$

Open code

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$$-6\left(29+54\log\left(\frac{1}{(e^{\pi}-e^{-\pi})^2}+\frac{256}{(e^{2\pi}-e^{-2\pi})^2}+\frac{6561}{(e^{3\pi}-e^{-3\pi})^2}\right)\right)$$

Open code

$$-174-648\pi+648\log\left(\left(e^{2\pi}-1\right)\left(1+e^{2\pi}\right)\left(1+e^{2\pi}+e^{4\pi}\right)\right)-$$
$$324\log\left(1+260\,e^{2\pi}+7081\,e^{4\pi}+13\,900\,e^{6\pi}+7081\,e^{8\pi}+260\,e^{10\pi}+e^{12\pi}\right)$$

Continued fraction:

- Linear form

$$1729+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{38+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{16+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Alternative representations:

- More

$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{\left(e^{\pi}-e^{-\pi}\right)^2}+\left(\frac{2^8}{\left(e^{2\pi}-e^{-2\pi}\right)^2}+\frac{3^8}{\left(e^{3\pi}-e^{-3\pi}\right)^2}\right)}\right)\right)=$$

$$-5-13^2+\log_e\left(\frac{1}{\frac{1^8}{\left(-e^{-\pi}+e^{\pi}\right)^2}+\frac{2^8}{\left(-e^{-2\pi}+e^{2\pi}\right)^2}+\frac{3^8}{\left(-e^{-3\pi}+e^{3\pi}\right)^2}}\right)18^2$$

Open code

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$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{\left(e^{\pi}-e^{-\pi}\right)^2}+\left(\frac{2^8}{\left(e^{2\pi}-e^{-2\pi}\right)^2}+\frac{3^8}{\left(e^{3\pi}-e^{-3\pi}\right)^2}\right)}\right)\right)=$$

$$-5-13^2+\log(a)\log_a\left(\frac{1}{\frac{1^8}{\left(-e^{-\pi}+e^{\pi}\right)^2}+\frac{2^8}{\left(-e^{-2\pi}+e^{2\pi}\right)^2}+\frac{3^8}{\left(-e^{-3\pi}+e^{3\pi}\right)^2}}\right)18^2$$

Open code

$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{(e^\pi-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)\right)=$$

$$-5-13^2-\text{Li}_1\left(1-\frac{1}{\frac{1^8}{(-e^{-\pi}+e^\pi)^2}+\frac{2^8}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{3^8}{(-e^{-3\pi}+e^{3\pi})^2}}\right)18^2$$

Series representations:

- More

$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{(e^\pi-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)\right)=$$

$$-174+324\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{1}{(e^{-\pi}-e^\pi)^2}+\frac{256\,e^{4\pi}}{(-1+e^{4\pi})^2}+\frac{6561\,e^{6\pi}}{(-1+e^{6\pi})^2}\right)^k}{k}$$

Open code

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$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{(e^\pi-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)\right)=$$

$$-174+324\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{1}{(-e^{-\pi}+e^\pi)^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}\right)^k}{k}$$

Open code

$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{(e^\pi-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)\right)=$$

$$-174-648\,i\,\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor-324\log(z_0)+$$

$$324\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{1}{(-e^{-\pi}+e^\pi)^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}-z_0\right)^k z_0^{-k}}{k}$$

Integral representation:

$$-\left(5+13^2-18^2\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)\right)=$$

$$-174-324\int_1^{\frac{1}{(-e^{-\pi}+e^{\pi})^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}}\frac{1}{t}\,dt$$

1729.368915786333206372996242552484289386216394370037291855

Also:

294 * ln (((1/ [((((1^8 /((e^Pi - e^(-Pi))^2))) + (((2^8 / ((e^(2Pi) - e^(-2Pi))^2))) + (((3^8 / ((e^(3Pi) - e^(-3Pi))^2))))]

Input:

$$294\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)$$

Open code

- $\log(x)$ is the natural logarithm

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Exact result:

$$-294\log\left(\frac{1}{(e^{\pi}-e^{-\pi})^2}+\frac{256}{(e^{2\pi}-e^{-2\pi})^2}+\frac{6561}{(e^{3\pi}-e^{-3\pi})^2}\right)$$

Decimal approximation:

- More digits

1727.131053213524576153274368242069077406011172669107912980...

Open code

Integral representation:

$$294\log\left(\frac{1}{\frac{1^8}{(e^{\pi}-e^{-\pi})^2}+\left(\frac{2^8}{(e^{2\pi}-e^{-2\pi})^2}+\frac{3^8}{(e^{3\pi}-e^{-3\pi})^2}\right)}\right)=$$

$$-294\int_1^{\frac{1}{(-e^{-\pi}+e^{\pi})^2}+\frac{256}{(-e^{-2\pi}+e^{2\pi})^2}+\frac{6561}{(-e^{-3\pi}+e^{3\pi})^2}}\frac{1}{t}\,dt$$

(1727.131053213524576153274368242069077406011172669107912980)^1/3

Input interpretation:

$$\sqrt[3]{1727.131053213524576153274368242069077406011172669107912980}$$

Open code

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- Result:
  More digits
  11.99798821184993213479089678544529275214947269445840084950...

This result 11,9979 is very near to the values of black hole entropies 11,8458 and 12,1904

2 * (1727.131053213524576153274368242069077406011172669107912980)^1/3

Input interpretation:

$2\sqrt[3]{1727.131053213524576153274368242069077406011172669107912980}$

Open code

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- Result:
  More digits
  23.99597642369986426958179357089058550429894538891680169901...

This value 23,9959 is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string.

(1727.131053213524576153274368242069077406011172669107912980)^1/15

Input interpretation:

$\sqrt[15]{1727.131053213524576153274368242069077406011172669107912980}$

Open code

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- Result:
  More digits
  1.643696711146681075949817755778687452308756973402126828905...

1.643696711146681075949817755778687452308756973402126828905

This value 1,643696 is very near to the golden ratio. It can be defined a golden number.

- Continued fraction:
  Linear form

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{7+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{119+\cfrac{1}{60+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}$$

Open code

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Possible closed forms:

- More

$$\frac{1}{7}(94\,C - 50 - 158\,\pi - 48\,\pi^2 - 8\,\pi\log(2) + 279\,\pi\log(3)) \approx$$
$$1.64369671114668107571570$$

$$2\,\pi\,\text{csch}^2\left(\frac{94574638}{66443045}\right) \approx 1.64369671114668107597 0832$$

$$\text{root of } 445\,x^4 - 5192\,x^3 + 7520\,x^2 - 473\,x + 269 \text{ near } x = 1.6437 \approx$$
$$1.64369671114668107594 38814$$

Note that, the mean of the following seven values is:

(1.643696+1.63158+1.643506+1.6437299+1.6487068+1.6437639+1.6437247)/7

Input interpretation:

$$\frac{1}{7}(1.643696 + 1.63158 + 1.643506 + 1.6437299 + 1.6487068 + 1.6437639 + 1.6437247)$$

Open code

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Result:

- More digits

1.642672471428571428571428571428571428571428571428571...

Open code

Now, we obtain:

3*1.642672471428571428571428571428571428571428571428571428571

Input interpretation:

$3 \times 1.642672471428571428571428571428571428571428571428571428571$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

$4.928017414285714285714285714285714285714285714285714285713\ldots$

4.928017414285714285714285714285714285714285714285714285713

Continued fraction:

- Linear form

$$4+\cfrac{1}{1+\cfrac{1}{12+\cfrac{1}{1+\cfrac{1}{8+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{\ldots}}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$\text{root of } 5077x^3 - 10172x^2 - 71227x - 9570 \text{ near } x = 4.92802 \approx$
$4.92801741428571428573802 5$

$\frac{5922457336\,\pi}{3775544381} \approx 4.928017414285714285676 21$

$\frac{1}{\text{root of } 9570x^3 + 71227x^2 + 10172x - 5077 \text{ near } x = 0.202921} \approx$
$4.928017414285714285738025$

Note that the value 4,928 is very near to the first value of upper bound dark photon energy range (1.8 * 10^{15} – 4.95 * 10^{16} – 5.4 * 10^{16}) (Physics Letters B 731 (2014) 265–271 - **Searching a dark photon with HADES**)

Furthermore, we have also that the value 4,928 is very near to the mean of the value n is: (3.8 + 3.8 + 5.8 + 5.8) / 4 = 4.8 keV concerning the emissivity index of relativistic reflection region (see fig.11)

We have also that:

pi (1.643696+1.643506+1.6437299+1.6437639+1.6437247)/5

Input interpretation:

$$\pi\left(\frac{1}{5}(1.643696 + 1.643506 + 1.6437299 + 1.6437639 + 1.6437247)\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

5.163786...

Series representations:

- More

$$\frac{1}{5}\pi(1.6437 + 1.64351 + 1.64373 + 1.64376 + 1.64372) = 6.57474\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

Open code

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$$\frac{1}{5}\pi(1.6437 + 1.64351 + 1.64373 + 1.64376 + 1.64372) = -3.28737 + 3.28737\sum_{k=1}^{\infty}\frac{2^k}{\binom{2k}{k}}$$

$$\frac{1}{5}\pi(1.6437 + 1.64351 + 1.64373 + 1.64376 + 1.64372) = 1.64368\sum_{k=0}^{\infty}\frac{2^{-k}(-6+50k)}{\binom{3k}{k}}$$

Integral representations:

- More

$$\frac{1}{5}\pi(1.6437 + 1.64351 + 1.64373 + 1.64376 + 1.64372) = 3.28737\int_0^{\infty}\frac{1}{1+t^2}\,dt$$

Open code

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$$\frac{1}{5}\pi(1.6437 + 1.64351 + 1.64373 + 1.64376 + 1.64372) = 6.57474\int_0^1\sqrt{1-t^2}\,dt$$

Open code

$$\frac{1}{5}\pi(1.6437 + 1.64351 + 1.64373 + 1.64376 + 1.64372) = 3.28737\int_0^{\infty}\frac{\sin(t)}{t}\,dt$$

This result 5,163786 is very near to the emissivity index of Q 2237+0305 object, that is equal to n > 5,4

From the 14th root of the following Ramanujan's class invariant $Q = \left(G_{505}/G_{101/5}\right)^3$ = 1164,2696 i.e. 1,65578..., we obtain:

pi (1164.2696)^1/14

Input interpretation:

$$\pi \sqrt[14]{1164.2696}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

5.20180057...

Series representations:

- More

$$\pi \sqrt[14]{1164.27} = 6.62314 \sum_{k=0}^{\infty} \frac{(-1)^k}{1+2k}$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\pi \sqrt[14]{1164.27} = -3.31157 + 3.31157 \sum_{k=1}^{\infty} \frac{2^k}{\binom{2k}{k}}$$

Open code

$$\pi \sqrt[14]{1164.27} = 1.65578 \sum_{k=0}^{\infty} \frac{2^{-k}(-6+50k)}{\binom{3k}{k}}$$

Integral representations:

- More

$$\pi \sqrt[14]{1164.27} = 3.31157 \int_0^{\infty} \frac{1}{1+t^2}\, dt$$

Open code

Enlarge Data Customize A Plaintext Interactive

$$\pi \sqrt[14]{1164.27} = 6.62314 \int_0^1 \sqrt{1-t^2}\, dt$$

Open code

$$\pi \sqrt[14]{1164.27} = 3.31157 \int_0^{\infty} \frac{\sin(t)}{t}\, dt$$

and also:

(((sqrt(8)+3)))/(((sqrt(3)))) *
1.6634293303835651095897770838134055007634717284953775838 46

Input interpretation:

$$\frac{\sqrt{8}+3}{\sqrt{3}} \times 1.663429330383565109589777083813405500763471728495377583846$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

5.597512836770766130234556418958608403038448227758886082238...

(((sqrt(8)+3)))/(((sqrt(3))))
(1.643696+1.643506+1.6437299+1.6437639+1.6437247)/5

Input interpretation:

$$\frac{\sqrt{8}+3}{\sqrt{3}} \left(\frac{1}{5} (1.643696 + 1.643506 + 1.6437299 + 1.6437639 + 1.6437247)\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

5.531069...

(((sqrt(8)+3)))/(((sqrt(3))))
(1.643696+1.63158+1.643506+1.6437299+1.6487068+1.6437639+1.6437247)/7

Input interpretation:

$$\frac{\sqrt{8}+3}{\sqrt{3}} \left(\frac{1}{7} (1.643696 + 1.63158 + 1.643506 + 1.6437299 + 1.6487068 + 1.6437639 + 1.6437247)\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

- More digits

5.527665...

The results 5.2018, 5.5975, 5.5310 and 5.5276 are very near to the emissivity index of Q 2237+0305 object, that is equal to n > 5,4

In conclusion, with the value of the golden ratio, we obtain:

(((sqrt(8)+3)))/(((sqrt(3)))) ((sqrt(5)+1))/2))

Input:

$$\frac{\sqrt{8}+3}{\sqrt{3}}\left(\frac{1}{2}\left(\sqrt{5}+1\right)\right)$$

Open code

Enlarge Data Customize A Plaintext Interactive

Result:

$$\frac{\left(3+2\sqrt{2}\right)\left(1+\sqrt{5}\right)}{2\sqrt{3}}$$

Decimal approximation:

- More digits

5.444755516166426833609016504882106899385661623096486617555...

5.444755516166426833609016504882106899385661623096486617555

Continued fraction:

- Linear form

$$5+\cfrac{1}{2+\cfrac{1}{4+\cfrac{1}{39+\cfrac{1}{2+\cfrac{1}{6+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{22+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{12+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{\cdots}}}}}}}}}}}}}}}}}}}}}$$

Open code

Enlarge Data Customize A Plaintext Interactive

Possible closed forms:

- More

$$\frac{\log(705155481818)}{\log(150)} \approx 5.44475551616642683319572$$

$$2\sqrt{\frac{31491535}{4249101}} \approx 5.44475551616642674228$$

$$\frac{1089\, e\, e! + 6862 - 2010\, e - 430\, e^2}{732\, e} \approx 5.4447555161664268833681683$$

This result 5,44475 is practically equal to the emissivity index of Q 2237+0305 object, that is equal to n > 5,4

Conclusion

We note that also different values concerning the physical parameters of black holes (not only entropies), are connected to the so-called "golden numbers", which in turn derive from various formulas of the beautiful and useful mathematics of S. Ramanujan

Appendix

(from: Draft version May 3, 2019
Typeset using LATEX preprint style in AASTeX61
CONSTRAINING QUASAR RELATIVISTIC REFLECTION REGIONS AND SPINS WITH MICROLENSING
Xinyu Dai, Shaun Steele, Eduardo Guerras, Christopher W. Morgan, and Bin Chen

For the joint constraint from a sample of four targets, our analysis showed that the relativistic reflection region is more likely to have an emissivity index of $n = 4.0 \pm 0.8$ and a half light radius of 5.9–7.4 r_g (1σ), and therefore originates from a more compact region relative to the continuum emission region. This result confirms the previous qualitative microlensing argument that point towards the reflection region belonging to a more compact region (e.g., Chen et al. 2012). The result also shows that the X-ray continuum cannot be a simple point source "lamppost" model, confirming the earlier analysis result of Popović et al. (2006). The spin value of the joint sample is constrained to be $a = 0.8 \pm 0.16$. This is in agreement with previous studies reporting high spin measurements (e.g., Reis et al. 2014; C.S. Reynolds 2014; M.T. Reynolds et al. 2014; Capellupo et al. 2015, 2017) either in the local or high redshift samples. For Q 2237+0305, both the spin and emissivity index parameters are well constrained individually with $a > 0.92$ and $n > 5.4$ corresponding to 2.25–3 r_g for spins between 0.9 and the maximal value. Overall, our spin measurements favor the "spin-up" black hole growth model, where most of the accretion occurs in a coherent phase with modest anisotropies, especially for $z > 1$ quasars (e.g., Dotti et al. 2013; Volonteri et al. 2013).

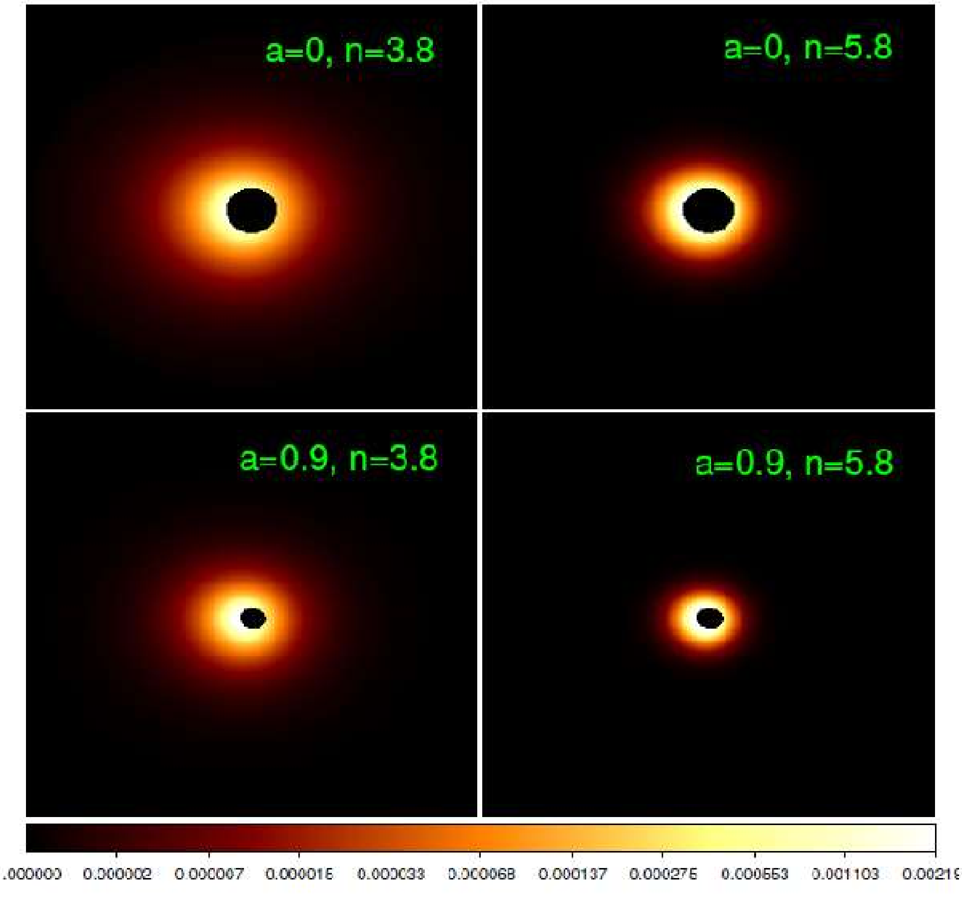

Figure 11. Example Kerr images of the Fe Kα emissivity profiles from KERTAP (Chen et al. 2015) with $a = 0, n = 3.8$ (top, left), $a = 0, n = 5.8$ (top, right), $a = 0.9, n = 3.8$ (bottom, left), and $a = 0.9, n = 5.8$ (bottom, right), where the inclination angle is fixed at 40°.

Note that the mean of the value n is: (3.8 + 3.8 + 5.8 + 5.8) / 4 = 4.8 keV concerning the emissivity index.

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