# On the Ramanujan's equations applied to various sectors of Particle Physics and Cosmology: new possible mathematical connections. IX

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## Abstract

*In this research thesis, we have analyzed further Ramanujan formulas and described new possible mathematical connections with some sectors of Particle Physics and Cosmology*

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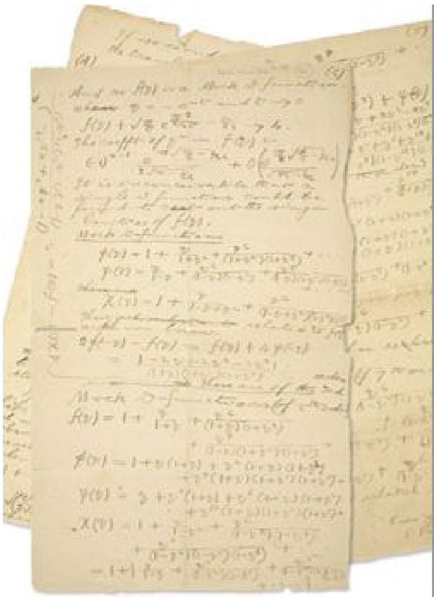


https://www.scientificamerican.com/article/one-of-srinivasa-ramanujans-neglected-manuscripts-has-helped-solve-long-standing-mathematical-mysteries/

**Summary**

**In this research thesis, we have analyzed further Ramanujan formulas and described new mathematical connections with some sectors of Particle Physics and Cosmology. We have described, as in previous papers, the possible and new connections between different formulas of Ramanujan's mathematics and some formulas concerning particle physics and cosmology. In the course of the discussion we describe and highlight the connections between some developments of Ramanujan equations and particles type solutions such as the mass of the Higgs boson, those in the range of the mass of candidates" glueball ", the scalar meson $f_0(1710)$ and the hypothetical mass of Gluino ("glueball" = 1760 ± 15 MeV; gluino = 1785.16 GeV) and the masses of proton (or neutron), and other baryons and mesons. Moreover solutions of Ramanujan equations, connected with the masses of the $\pi$ mesons (139.576 and 134.9766 MeV) have been described and highlighted. We have showed also the mathematical connections between some Ramanujan equations, the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of $u \to \infty$, the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane and the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series.**

**Further, we have described the connections between the mathematics of Ramanujan and different equations concerning some areas of theoretical physics such as the topics covered in the following book: " Chandrasekhar, S. (1998) [1983].** ***The Mathematical Theory of Black Holes*****". Is our opinion, that the possible connections between the mathematical developments of some Rogers-Ramanujan continued** fractions**, the value of the dilaton and that of "the dilaton mass calculated as a type of Higgs boson that is equal about to 125 GeV", and the Higgs boson mass itself, are fundamental.**

**All the results of the most important connections are highlighted in blue throughout the drafting of the paper**

**From:**

**MANUSCRIPT BOOK 2 OF SRINIVASA RAMANUJAN**

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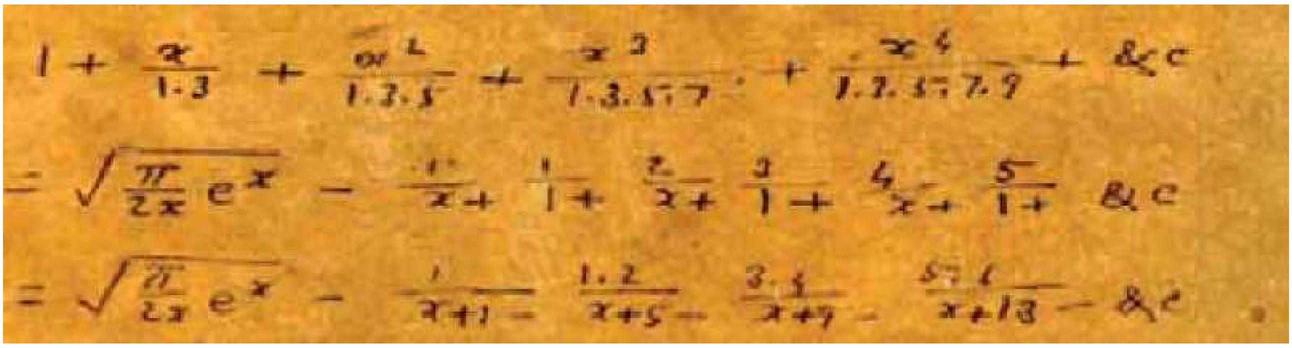


$$1+\frac{x}{1.3}+\frac{x^2}{1.3.5}+\frac{x^3}{1.3.5.7}+\frac{x^4}{1.3.5.7.9}+\&c$$
$$=\sqrt{\frac{\pi}{2x}e^x}-\frac{1}{x+}\,\frac{1}{1+}\,\frac{2}{x+}\,\frac{3}{1+}\,\frac{4}{x+}\,\frac{5}{1+}\ \&c$$
$$=\sqrt{\frac{\pi}{2x}e^x}-\frac{1}{x+1-}\,\frac{1.2}{x+5-}\,\frac{3.4}{x+9-}\,\frac{5.6}{x+13-}\ \&c.$$

1+2/3+2^2/(1*3*5)+2^3/(1*3*5*7)+2^4/(1*3*5*7*9)

**Input:**

$$1+\frac{2}{3}+\frac{2^2}{3\times 5}+\frac{2^3}{3\times 5\times 7}+\frac{2^4}{3\times 5\times 7\times 9}$$

**Exact result:**

$$\frac{383}{189}$$

**Decimal approximation:**

2.026455026455026455026455026455026455026455026455026455026455026...

2.026455026455…

**Repeating decimal:**

$2.\overline{026455}$ (period 6)

2.026455

sqrt(Pi/4 * e^2)

**Input:**

$$\sqrt{\frac{\pi}{4} e^2}$$

**Exact result:**

$$\frac{e\sqrt{\pi}}{2}$$

**Decimal approximation:**

2.409014547349361028560765545623059407106512855599299265966...

2.409014547…

**All 2nd roots of (e^2 π)/4:**

$$\frac{1}{2} e \sqrt{\pi}\, e^0 \approx 2.4090 \quad \text{(real, principal root)}$$

$$\frac{1}{2} e \sqrt{\pi}\, e^{i\pi} \approx -2.4090 \quad \text{(real root)}$$

**Series representations:**

$$\sqrt{\frac{e^2 \pi}{4}} = \sqrt{-1 + \frac{e^2 \pi}{4}} \sum_{k=0}^{\infty} \left(-1 + \frac{e^2 \pi}{4}\right)^{-k} \binom{\frac{1}{2}}{k}$$

$$\sqrt{\frac{e^2 \pi}{4}} = \sqrt{-1 + \frac{e^2 \pi}{4}} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-1 + \frac{e^2 \pi}{4}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{\frac{e^2 \pi}{4}} = \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{e^2 \pi}{4} - z_0\right)^k z_0^{-k}}{k!} \quad \text{for not } ((z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))$$

Now:

$$1 + \frac{x}{1\cdot 3} + \frac{x^2}{1\cdot 3\cdot 5} + \frac{x^3}{1\cdot 3\cdot 5\cdot 7} + \frac{x^4}{1\cdot 3\cdot 5\cdot 7\cdot 9} + \&c$$

$$= \sqrt{\frac{\pi}{2x} e^x} - \frac{1}{x+1-}\,\frac{1.2}{x+5-}\,\frac{3.4}{x+9-}\,\frac{5.6}{x+13-}\,\&c$$

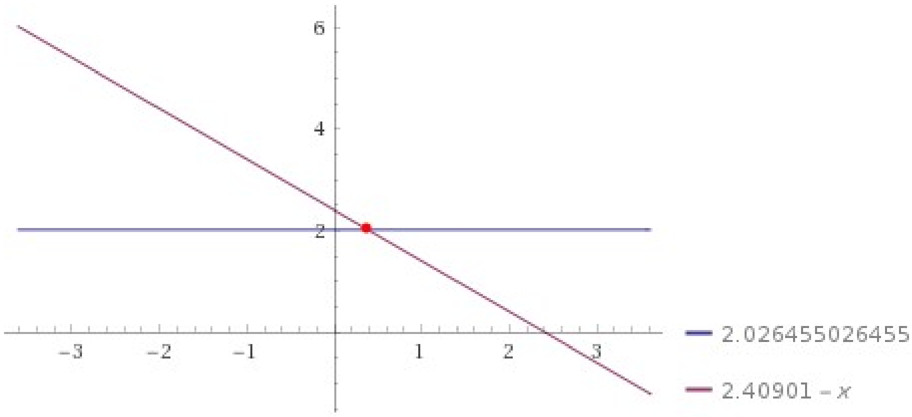
From the two results, we obtain:

2.026455026455 = 2.409014547 – x

**Input interpretation:**

$2.026455026455 = 2.409014547 - x$

**Plot:**




**Alternate forms:**

$x - 0.38256 = 0$

$2.026455026455 = 2.40901 - x$

**Solution:**

$x \approx 0.38256$

0.38256

Or:

-2.026455026455026455+ sqrt(Pi/4 * e^2)

**Input interpretation:**

$-2.026455026455026455 + \sqrt{\frac{\pi}{4} e^2}$

**Result:**

0.382559520894334574...

0.38255952… = x

$$-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}} = -2.02645502645502645500000+\sqrt{-1+\frac{e^2\pi}{4}}\sum_{k=0}^{\infty}\left(-1+\frac{e^2\pi}{4}\right)^{-k}\binom{\frac{1}{2}}{k}$$

$$-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}} = -2.02645502645502645500000+\sqrt{-1+\frac{e^2\pi}{4}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\frac{e^2\pi}{4}\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

$$-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}} = -2.02645502645502645500000+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{e^2\pi}{4}-z_0\right)^k z_0^{-k}}{k!}$$

for not $((z_0 \in \mathbb{R}$ and $-\infty < z_0 \le 0))$

-ln(((-2.026455026455026455+ sqrt(Pi/4 * e^2))))

**Input interpretation:**

$$-\log\left(-2.026455026455026455+\sqrt{\frac{\pi}{4}e^2}\right)$$

log(x) is the natural logarithm

**Result:**

0.960871027640288059...

0.960871027…. result very near to the spectral index $n_s$ , to the mesonic Regge slope, to the inflaton value at the end of the inflation 0.9402 (see Appendix) and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}}-\varphi+1} = 1-\cfrac{e^{-\pi}}{1+\cfrac{e^{-2\pi}}{1+\cfrac{e^{-3\pi}}{1+\cfrac{e^{-4\pi}}{1+\ldots}}}} \approx 0.9568666373$$

From:

Astronomy & Astrophysics manuscript no. ms c ESO 2019 - September 24, 2019
**Planck 2018 results. VI. Cosmological parameters**

*The primordial fluctuations are consistent with Gaussian purely adiabatic scalar perturbations characterized by a power spectrum with a spectral index $n_s = 0.965 \pm 0.004$, consistent with the predictions of slow-roll, single-field, inflation.*

We know that α' is the Regge slope (string tension). With regard the Omega mesons, the values are:

| | | | |
|---|---|---|---|
| $\omega$ | 6 | $m_{u/d} = 0 - 60$ | 0.910 – 0.918 |
| $\omega/\omega_3$ | 5 + 3 | $m_{u/d} = 255 - 390$ | 0.988 – 1.18 |
| $\omega/\omega_3$ | 5 + 3 | $m_{u/d} = 240 - 345$ | 0.937 – 1.000 |

**Alternative representations:**

$$-\log\left(-2.0264550264550264550000 + \sqrt{\frac{e^2 \pi}{4}}\right) =$$

$$-\log_e\left(-2.0264550264550264550000 + \sqrt{\frac{\pi e^2}{4}}\right)$$

$$-\log\left(-2.0264550264550264550000 + \sqrt{\frac{e^2 \pi}{4}}\right) =$$

$$-\log(a) \log_a\left(-2.0264550264550264550000 + \sqrt{\frac{\pi e^2}{4}}\right)$$

$$-\log\left(-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}}\right)=$$
$$\text{Li}_1\left(3.02645502645502645500000-\sqrt{\frac{\pi e^2}{4}}\right)$$

## Series representations:

$$-\log\left(-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}}\right)=$$
$$\sum_{k=1}^{\infty}\frac{(-1)^k\left(-3.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}}\right)^k}{k}$$

$$-\log\left(-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}}\right)=$$
$$-\log\left(-2.02645502645502645500000+\sqrt{-1+\frac{e^2\pi}{4}}\sum_{k=0}^{\infty}\left(-1+\frac{e^2\pi}{4}\right)^{-k}\binom{\frac{1}{2}}{k}\right)$$

$$-\log\left(-2.02645502645502645500000+\sqrt{\frac{e^2\pi}{4}}\right)=$$
$$-2i\pi\left\lfloor\frac{1}{2\pi}\arg\left(-2.02645502645502645500000-1.00000000000000000000000\,x+\sqrt{\frac{e^2\pi}{4}}\right)\right\rfloor-$$
$$\log(x)+\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k x^{-k}\left(-2.02645502645502645500000-1.00000000000000000000000\,x+\sqrt{\frac{e^2\pi}{4}}\right)^k \quad \text{for } x<0$$

## Integral representation:

$$-\log\left(-2.0264550264550264550000+\sqrt{\frac{e^2\,\pi}{4}}\right)=$$

$$-\int_1^{-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}}\frac{1}{t}\,dt$$

-1/(((-ln(((-2.026455026455026455+ sqrt(Pi/4 * e^2))))^128)))-29+golden ratio^2

**Input interpretation:**

$$\frac{-1}{-\log^{128}\left(-2.026455026455026455+\sqrt{\frac{\pi}{4}\,e^2}\right)}-29+\phi^2$$

log(x) is the natural logarithm

$\phi$ is the golden ratio

**Result:**

139.1444730653342...

139.1444730653342…. result very near to the rest mass of Pion meson 139.57

**Alternative representations:**

$$\frac{-1}{-\log^{128}\left(-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)}-29+\phi^2=$$
$$-29+\phi^2--\frac{1}{\log_e^{128}\left(-2.0264550264550264550000+\sqrt{\frac{\pi e^2}{4}}\right)}$$

$$\frac{-1}{-\log^{128}\left(-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)}-29+\phi^2=$$
$$-29+\phi^2--\frac{1}{\left(\log(a)\log_a\left(-2.0264550264550264550000+\sqrt{\frac{\pi e^2}{4}}\right)\right)^{128}}$$

$$\frac{-1}{-\log^{128}\left(-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)}-29+\phi^2 = -29+\phi^2 - -\frac{1}{\left(-\text{Li}_1\left(3.0264550264550264550000-\sqrt{\frac{\pi e^2}{4}}\right)\right)^{128}}$$

**Series representations:**

$$\frac{-1}{-\log^{128}\left(-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)}-29+\phi^2 = -29+\phi^2 + \frac{1}{\left(\sum_{k=1}^{\infty}\frac{(-1)^k\left(-3.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)^k}{k}\right)^{128}}$$

$$\frac{-1}{-\log^{128}\left(-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)}-29+\phi^2 = -29+\phi^2 + \frac{1}{\log^{128}\left(-2.0264550264550264550000+\sqrt{-1+\frac{e^2\pi}{4}}\ \sum_{k=0}^{\infty}\left(-1+\frac{e^2\pi}{4}\right)^{-k}\binom{\frac{1}{2}}{k}\right)}$$

$$\frac{-1}{-\log^{128}\left(-2.0264550264550264550000+\sqrt{\frac{e^2\pi}{4}}\right)}-29+\phi^2 = -29+\phi^2 + 1\Big/\left(2 i\pi\left\lfloor\frac{1}{2\pi}\arg\left(-2.0264550264550264550000-1.0000000000000000000000\,x+\sqrt{\frac{e^2\pi}{4}}\right)\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k x^{-k}\left(-2.0264550264550264550000-1.0000000000000000000000\,x+\sqrt{\frac{e^2\pi}{4}}\right)^k\right)^{128} \quad \text{for } x<0$$

**Integral representation:**

$$\frac{-1}{-\log^{128}\left(-2.02645502645502645500000+\sqrt{\frac{e^2\,\pi}{4}}\right)}-29+\phi^2=$$

$$-29+\phi^2+\frac{1}{\left(\int_1^{-2.02645502645502645500000+\sqrt{\frac{e^2\,\pi}{4}}}\frac{1}{t}\,dt\right)^{128}}$$

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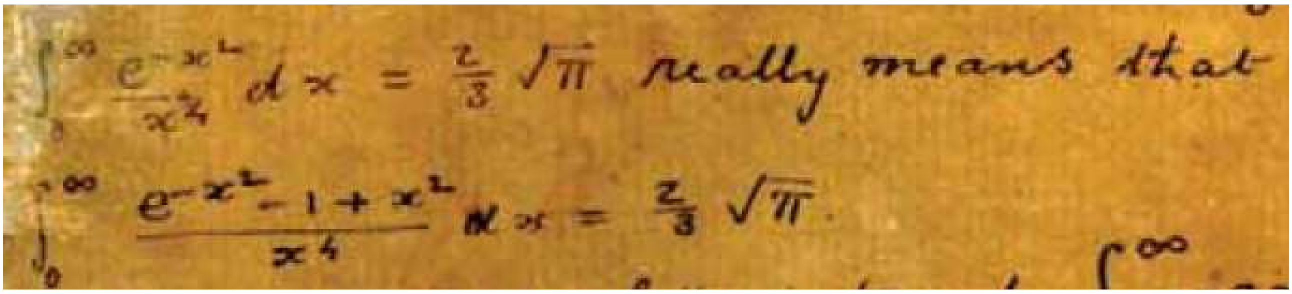


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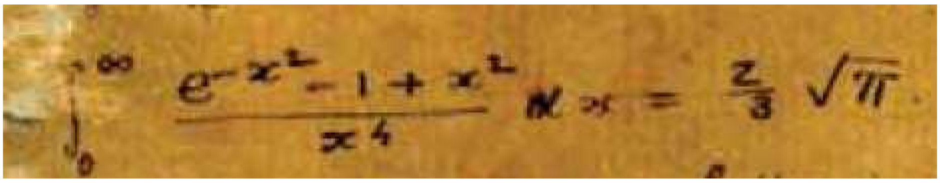

We have, developing the right-hand side

2/3*sqrt(Pi)

**Input:**

$$\frac{2}{3}\sqrt{\pi}$$

**Exact result:**

$$\frac{2\sqrt{\pi}}{3}$$

**Decimal approximation:**

1.1816359006036773515321116555607634551983663040815914188 09...

1.1816359006…

**Property:**

$\frac{2\sqrt{\pi}}{3}$ is a transcendental number

**Series representations:**

$$\frac{\sqrt{\pi}\ 2}{3} = \frac{2}{3}\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}$$

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

$$\frac{\sqrt{\pi}\ 2}{3} = \frac{2}{3}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\pi-z_0)^k z_0^{-k}}{k!} \quad \text{for not } ((z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))$$

1/10^27*((((2/3*sqrt(Pi)))^3+(18+4)/10^3))

**Input:**

$$\frac{1}{10^{27}}\left(\left(\frac{2}{3}\sqrt{\pi}\right)^3+\frac{18+4}{10^3}\right)$$

**Exact result:**

$$\frac{\frac{11}{500}+\frac{8\pi^{3/2}}{27}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

**Decimal approximation:**

$1.6718749620242097319362423650722476154114442637876278... \times 10^{-27}$

1.671874962…*10$^{-27}$

**Property:**

$\frac{\frac{11}{500}+\frac{8\pi^{3/2}}{27}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000}$ is a transcendental number

**Alternate forms:**

$$\frac{297 + 4000\,\pi^{3/2}}{13\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{11}{500\,000\,000\,000\,000\,000\,000\,000\,000\,000} + \frac{\pi^{3/2}}{3\,375\,000\,000\,000\,000\,000\,000\,000\,000}$$

**Series representations:**

$$\frac{\left(\frac{2\sqrt{\pi}}{3}\right)^3 + \frac{18+4}{10^3}}{10^{27}} = \frac{11}{500\,000\,000\,000\,000\,000\,000\,000\,000\,000} + \frac{\left(\sum_{k=0}^{\infty} \frac{(-1)^k}{1+2k}\right)^{3/2}}{421\,875\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{\left(\frac{2\sqrt{\pi}}{3}\right)^3 + \frac{18+4}{10^3}}{10^{27}} = \frac{\frac{11}{500} + \frac{64}{27}\left(\sum_{k=0}^{\infty} \frac{(-1)^{1+k}\,1195^{-1-2k}\left(5^{1+2k} - 4 \times 239^{1+2k}\right)}{1+2k}\right)^{3/2}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{\left(\frac{2\sqrt{\pi}}{3}\right)^3 + \frac{18+4}{10^3}}{10^{27}} = \frac{11}{500\,000\,000\,000\,000\,000\,000\,000\,000\,000} + \frac{\left(\sum_{k=0}^{\infty} \left(-\frac{1}{4}\right)^k \left(\frac{1}{1+2k} + \frac{2}{1+4k} + \frac{1}{3+4k}\right)\right)^{3/2}}{3\,375\,000\,000\,000\,000\,000\,000\,000\,000}$$

**Integral representations:**

$$\frac{\left(\frac{2\sqrt{\pi}}{3}\right)^3 + \frac{18+4}{10^3}}{10^{27}} = \frac{11}{500\,000\,000\,000\,000\,000\,000\,000\,000\,000} + \frac{\left(\int_0^1 \sqrt{1-t^2}\,dt\right)^{3/2}}{421\,875\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{\left(\frac{2\sqrt{\pi}}{3}\right)^3 + \frac{18+4}{10^3}}{10^{27}} = \frac{\frac{11}{500} + \frac{8}{27}\left(\frac{3\sqrt{3}}{4} + 24\int_0^{\frac{1}{4}} \sqrt{t-t^2}\,dt\right)^{3/2}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{\left(\frac{2\sqrt{\pi}}{3}\right)^3 + \frac{18+4}{10^3}}{10^{27}} = \frac{11}{500\,000\,000\,000\,000\,000\,000\,000\,000\,000} + \frac{\left(\int_0^1 \frac{1}{\sqrt{1-t^2}}\,dt\right)^{3/2}}{843\,750\,000\,000\,000\,000\,000\,000\,000\,\sqrt{2}}$$

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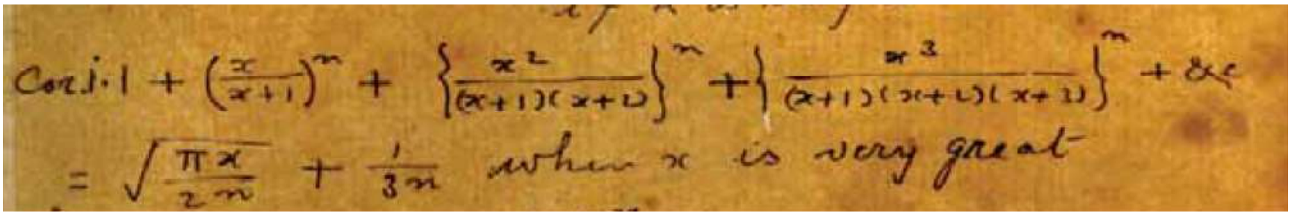

Cor. 1. $1 + \left(\frac{x}{x+1}\right)^n + \left\{\frac{x^2}{(x+1)(x+2)}\right\}^n + \left\{\frac{x^3}{(x+1)(x+2)(x+3)}\right\}^n + \&c = \sqrt{\frac{\pi x}{2n}} + \frac{1}{3n}$ when $x$ is very great

Now, we have that, for x = 4096 and n = 6:

sqrt((Pi*4096)/(2)^6)+1/(3)^6

**Input:**

$$\sqrt{\frac{\pi \times 4096}{2^6}} + \frac{1}{3^6}$$

**Exact result:**

$$\frac{1}{729} + 8\sqrt{\pi}$$

**Decimal approximation:**

14.181002549356611071608933831063866537826211835536024323337...

14.18100254935…

**Property:**

$\frac{1}{729} + 8\sqrt{\pi}$ is a transcendental number

**Alternate form:**

$$\frac{1}{729}\left(1 + 5832\sqrt{\pi}\right)$$

**Series representations:**

$$\sqrt{\frac{\pi\, 4096}{2^6}} + \frac{1}{3^6} = \frac{1}{729} + \sqrt{-1 + 64\pi} \sum_{k=0}^{\infty} (-1 + 64\pi)^{-k} \binom{\frac{1}{2}}{k}$$

$$\sqrt{\frac{\pi\, 4096}{2^6}} + \frac{1}{3^6} = \frac{1}{729} + \sqrt{-1 + 64\pi} \sum_{k=0}^{\infty} \frac{(-1)^k (-1 + 64\pi)^{-k} \left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{\frac{\pi\,4096}{2^6}} + \frac{1}{3^6} = \frac{1}{729} + \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (64\pi - z_0)^k z_0^{-k}}{k!}$$

for not $((z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0))$

From the exact result:

$$\frac{1}{729} + 8\sqrt{\pi}$$

we can to obtain:

1/x + 8 sqrt(π) = 14.181002549356611

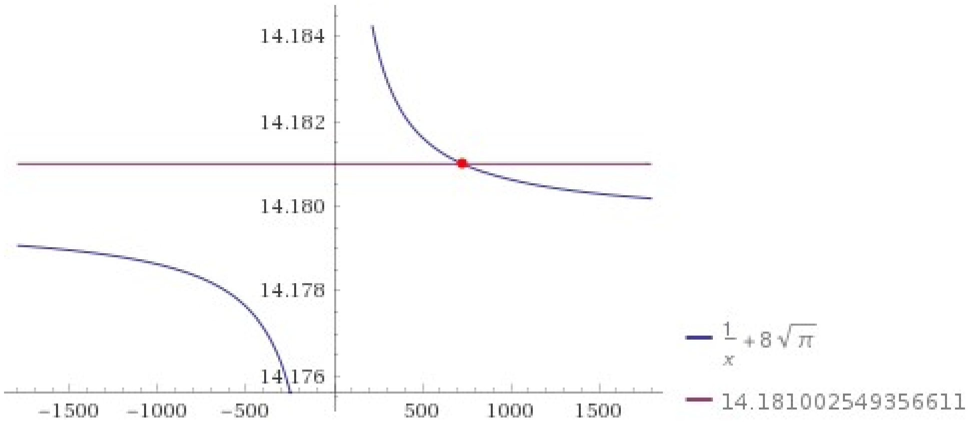
**Input interpretation:**

$$\frac{1}{x} + 8\sqrt{\pi} = 14.181002549356611$$

**Result:**

$$\frac{1}{x} + 8\sqrt{\pi} = 14.181002549356611$$

**Plot:**




**Alternate form assuming x is real:**

$$\frac{729.00000000}{x} = 1.00000000000$$

**Alternate form:**

$$\frac{8\sqrt{\pi}\,x + 1}{x} = 14.181002549356611$$

**Alternate form assuming x is positive:**

$1.000000000000\,x = 729.000000000$ (for $x \neq 0$)

**Solution:**

$x = 729$

729

From:

$$\frac{1}{729} + 8\sqrt{\pi}$$

We obtain also the following expression:

**Input:**

$$729 + \frac{729}{\frac{1}{729} + 8\sqrt{\pi}} + \phi$$

$\phi$ is the golden ratio

**Decimal approximation:**

782.0248366786679336609595668963925494098803975079518256470...

782.0248366786…. result practically equal to the rest mass of Omega meson 782.65

**Property:**

$729 + \phi + \frac{729}{\frac{1}{729} + 8\sqrt{\pi}}$ is a transcendental number

**Alternate forms:**

$$\phi + 729 + \frac{531441}{1 + 5832\sqrt{\pi}}$$

$$\frac{1}{2}\left(1459 + \sqrt{5}\right) + \frac{531441}{1 + 5832\sqrt{\pi}}$$

$$\frac{1459}{2} + \frac{\sqrt{5}}{2} + \frac{729}{\frac{1}{729} + 8\sqrt{\pi}}$$

**Series representations:**

$$729 + \frac{729}{\frac{1}{729} + 8\sqrt{\pi}} + \phi = 729 + \phi + \frac{729}{\frac{1}{729} + 8\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}}$$

$$729+\frac{729}{\frac{1}{729}+8\sqrt{\pi}}+\phi=729+\phi+\frac{729}{\frac{1}{729}+8\sqrt{-1+\pi}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+\pi)^{-k}\left(-\frac{1}{2}\right)_k}{k!}}$$

$$729+\frac{729}{\frac{1}{729}+8\sqrt{\pi}}+\phi=729+\phi+\frac{729}{\frac{1}{729}+8\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\pi-z_0)^k z_0^{-k}}{k!}}$$

for not $((z_0\in\mathbb{R}$ and $-\infty<z_0\leq 0))$

And:

1729/((1/729 + 8 sqrt(π)))+Pi+1/golden ratio

**Input:**

$$\frac{1729}{\frac{1}{729}+8\sqrt{\pi}}+\pi+\frac{1}{\phi}$$

$\phi$ is the golden ratio

**Decimal approximation:**

125.6833054501151189608145011740848249856551915001198845338...

125.68330545…. result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18

**Property:**

$\frac{1}{\phi}+\frac{1729}{\frac{1}{729}+8\sqrt{\pi}}+\pi$ is a transcendental number

**Alternate forms:**

$$\frac{2}{1+\sqrt{5}}+\frac{1260441}{1+5832\sqrt{\pi}}+\pi$$

$$\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1729}{\frac{1}{729}+8\sqrt{\pi}}+\pi$$

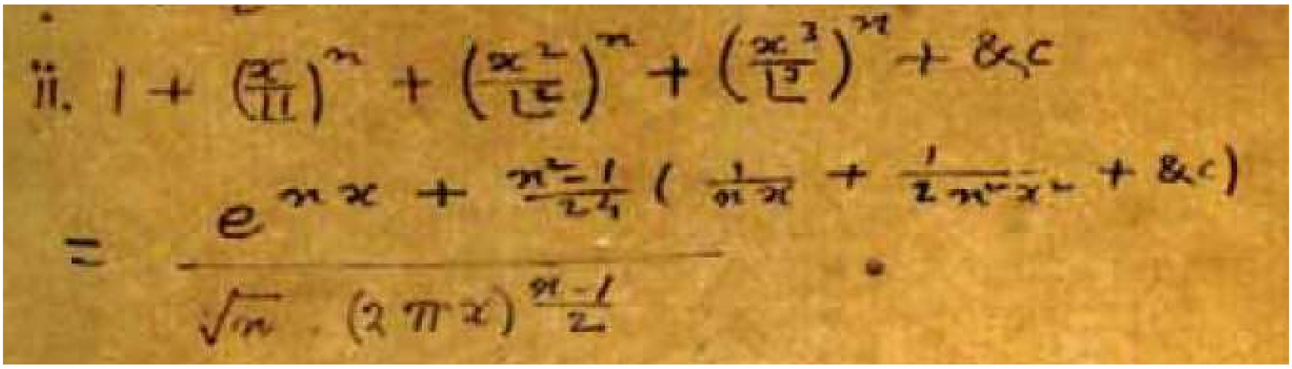
$$\frac{\left(1260441+\pi+5832\,\pi^{3/2}\right)\phi+1+5832\sqrt{\pi}}{\left(1+5832\sqrt{\pi}\right)\phi}$$

**Series representations:**

$$\frac{1729}{\frac{1}{729}+8\sqrt{\pi}}+\pi+\frac{1}{\phi}=\frac{1}{\phi}+\pi+\frac{1729}{\frac{1}{729}+8\sqrt{-1+\pi}\sum_{k=0}^{\infty}(-1+\pi)^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{1729}{\frac{1}{729}+8\sqrt{\pi}}+\pi+\frac{1}{\phi}=\frac{1}{\phi}+\pi+\frac{1729}{\frac{1}{729}+8\sqrt{-1+\pi}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+\pi)^{-k}\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{1729}{\frac{1}{729}+8\sqrt{\pi}}+\pi+\frac{1}{\phi}=\frac{1}{\phi}+\pi+\frac{1260441\sqrt{\pi}}{\sqrt{\pi}+2916\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j}(-1+\pi)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}$$



we have that, for x = 8 and n = 2:

(((exp(8*2+3/24(1/(2*8)+1/(2*2^2*8^2))))))*1/((((sqrt2)*(8*2Pi)^1/2)))

**Input:**

$$\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)\times\frac{1}{\sqrt{2}\sqrt{8\times 2\pi}}$$

**Exact result:**

$$\frac{e^{65569/4096}}{4\sqrt{2\pi}}$$

**Decimal approximation:**

893430.4282929778502834255292078124731495527874892046099486...

893430.42829…

**Series representations:**

$$\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}} = \frac{\exp\left(\frac{65569}{4096}\right)}{4\sqrt{\pi}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}$$

for not $((z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))$

$$\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}} = \frac{\exp\left(\frac{65569}{4096}\right)}{4\sqrt{\pi}\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}$$

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

$$\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}} = \frac{\exp\left(\frac{65569}{4096}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{-1/2-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}}{4\sqrt{\pi}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}$$

sqrt((((((exp(8*2+3/24(1/(2*8)+1/(2*2^2*8^2))))))*1/((((sqrt2)*(8*2Pi)^1/2))))))+11 +golden ratio

**Input:**

$$\sqrt{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)\times\frac{1}{\sqrt{2}\sqrt{8\times 2\pi}}}+11+\phi$$

$\phi$ is the golden ratio

**Exact result:**

$$\phi+11+\frac{e^{65569/8192}}{2\sqrt[4]{2\pi}}$$

**Decimal approximation:**

957.8325219717567709992273391166316468458115434081669558688...

957.83252197…. result practically equal to the rest mass of Eta prime meson 957.78

**Alternate forms:**

$$\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{e^{65569/8192}}{2\sqrt[4]{2\pi}}$$

$$11+\frac{1}{2}\left(1+\sqrt{5}\right)+\frac{e^{65\,569/8192}}{2\sqrt[4]{2\pi}}$$

$$\frac{2\sqrt[4]{2\pi}\,(\phi+11)+e^{65\,569/8192}}{2\sqrt[4]{2\pi}}$$

**Series representations:**

$$\sqrt{\frac{\exp\left(8\times2+\frac{3}{24}\left(\frac{1}{2\times8}+\frac{1}{2\times2^2\times8^2}\right)\right)}{\sqrt{2}\sqrt{8\times2\pi}}}+11+\phi=\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{e^{65\,569/8192}}{2\times2^{3/4}\sqrt[4]{\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}}}$$

$$\sqrt{\frac{\exp\left(8\times2+\frac{3}{24}\left(\frac{1}{2\times8}+\frac{1}{2\times2^2\times8^2}\right)\right)}{\sqrt{2}\sqrt{8\times2\pi}}}+11+\phi=\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{65\,569/8192}}{2\sqrt[4]{2\pi}}$$

$$\sqrt{\frac{\exp\left(8\times2+\frac{3}{24}\left(\frac{1}{2\times8}+\frac{1}{2\times2^2\times8^2}\right)\right)}{\sqrt{2}\sqrt{8\times2\pi}}}+11+\phi=\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{65\,569/8192}}{2\sqrt[4]{2\pi}}$$

**Integral representations:**

$$\sqrt{\frac{\exp\left(8\times2+\frac{3}{24}\left(\frac{1}{2\times8}+\frac{1}{2\times2^2\times8^2}\right)\right)}{\sqrt{2}\sqrt{8\times2\pi}}}+11+\phi=\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{e^{65\,569/8192}}{2\sqrt{2}\sqrt[4]{\int_0^1\frac{1}{\sqrt{1-t^2}}\,dt}}$$

$$\sqrt{\frac{\exp\left(8\times2+\frac{3}{24}\left(\frac{1}{2\times8}+\frac{1}{2\times2^2\times8^2}\right)\right)}{\sqrt{2}\sqrt{8\times2\pi}}}+11+\phi=\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{e^{65\,569/8192}}{2\times2^{3/4}\sqrt[4]{\int_0^1\sqrt{1-t^2}\,dt}}$$

$$\sqrt{\frac{\exp\left(8\times2+\frac{3}{24}\left(\frac{1}{2\times8}+\frac{1}{2\times2^2\times8^2}\right)\right)}{\sqrt{2}\sqrt{8\times2\pi}}}+11+\phi=\frac{23}{2}+\frac{\sqrt{5}}{2}+\frac{e^{65\,569/8192}}{2\sqrt{2}\sqrt[4]{\int_0^{\infty}\frac{1}{1+t^2}\,dt}}$$

Or:

sqrt((((((exp(8*2+3/24(1/(2*8)+1/(2*2^2*8^2))))))*1/((((sqrt2)*(8*2Pi)^1/2))))))-7

**Input:**

$$\sqrt{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)\times\frac{1}{\sqrt{2}\sqrt{8\times 2\pi}}}-7$$

**Exact result:**

$$\frac{e^{65569/8192}}{2\sqrt[4]{2\pi}}-7$$

**Decimal approximation:**

938.2144879830068761510227522822660087280912342283611930066...

938.214487983…. result practically equal to the rest mass of the proton 938.272

**Alternate forms:**

$$\frac{e^{65569/8192}-14\sqrt[4]{2\pi}}{2\sqrt[4]{2\pi}}$$

$$\frac{2^{3/4}e^{65569/8192}-28\sqrt[4]{\pi}}{4\sqrt[4]{\pi}}$$

$$-\frac{28\sqrt[4]{\pi}-2^{3/4}e^{65569/8192}}{4\sqrt[4]{\pi}}$$

**Series representations:**

$$\sqrt{\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}}}-7=-7+\frac{e^{65569/8192}}{2\times 2^{3/4}\sqrt[4]{\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}}}$$

$$\sqrt{\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}}}-7=-7+\frac{\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{65569/8192}}{2\sqrt[4]{2\pi}}$$

$$\sqrt{\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}}}-7=-7+\frac{\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{65569/8192}}{2\sqrt[4]{2\pi}}$$

**Integral representations:**

$$\sqrt{\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}}}-7=-7+\frac{e^{65569/8192}}{2\sqrt{2}\sqrt[4]{\int_0^1 \frac{1}{\sqrt{1-t^2}}\,dt}}$$

$$\sqrt{\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}}}-7=-7+\frac{e^{65569/8192}}{2\times 2^{3/4}\sqrt[4]{\int_0^1\sqrt{1-t^2}\,dt}}$$

$$\sqrt{\frac{\exp\left(8\times 2+\frac{3}{24}\left(\frac{1}{2\times 8}+\frac{1}{2\times 2^2\times 8^2}\right)\right)}{\sqrt{2}\sqrt{8\times 2\pi}}}-7=-7+\frac{e^{65569/8192}}{2\sqrt{2}\sqrt[4]{\int_0^\infty \frac{1}{1+t^2}\,dt}}$$

For x = 4096 and n = 6, we obtain:

(((((((exp(((((4096*6+35/24(1/(6*4096)+1/(((2*4096^2*6^2)))))))))))))*((1/((sqrt6)*(4096*2Pi)^(5/2))))))

**Input:**

$$\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)\times\frac{1}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}$$

**Exact result:**

$$\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}$$

**Decimal approximation:**

$6.3942241989781554802968221969069962428570776106665 7\ldots\times 10^{10661}$

6.394224198978…*$10^{10661}$

**Series representations:**

$$\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}=\frac{\exp\left(\frac{712483536519203}{28991029248}\right)}{4294967296\sqrt{2}\,\pi^{5/2}\sqrt{5}\sum_{k=0}^{\infty}5^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}=$$

$$\frac{\exp\left(\frac{712483536519203}{28991029248}\right)}{4294967296\sqrt{2}\,\pi^{5/2}\sqrt{5}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}=$$

$$\frac{\exp\left(\frac{712483536519203}{28991029248}\right)\sqrt{\pi}}{2147483648\sqrt{2}\,\pi^{5/2}\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,5^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}$$

3ln(((((((((((exp(((((4096*6+35/24(1/(6*4096)+1/(((2*4096^2*6^2)))))))))))))*((1/((sqrt6)*(4096*2Pi)^(5/2))))))))))-144-13

Where 144 and 13 are Lucas numbers

**Input:**

$$3\log\left(\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)\times\frac{1}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13$$

log(x) is the natural logarithm

**Exact result:**

$$3\log\left(\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}\right)-157$$

**Decimal approximation:**

73492.14521457052028770358564121253934642175509532029132443...

73492.14521457….

**Alternate forms:**

$$\frac{710966339321891}{9663676416}-3\log\left(8589934592\sqrt{3}\,\pi^{5/2}\right)$$

$$3\left(\frac{712483536519203}{28991029248}-\frac{\log(3)}{2}-\log(8589934592)-\frac{5\log(\pi)}{2}\right)-157$$

$$3\log\left(\text{Factor}\left[\frac{e^{712483536519203/28991029248}}{\sqrt{3}}, \text{Extension}\to\text{Automatic}, \text{Trig}\to\text{True}\right]\right)-157-\frac{15\log(\pi)}{2}-99\log(2)$$

**Alternative representations:**

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=-157+3\log_e\left(\frac{\exp\left(24576+\frac{35}{24}\left(\frac{1}{24576}+\frac{1}{2\times 6^2\times 4096^2}\right)\right)}{(8192\pi)^{5/2}\sqrt{6}}\right)$$

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=-157+3\log(a)\log_a\left(\frac{\exp\left(24576+\frac{35}{24}\left(\frac{1}{24576}+\frac{1}{2\times 6^2\times 4096^2}\right)\right)}{(8192\pi)^{5/2}\sqrt{6}}\right)$$

**Series representations:**

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=-157+3\log\left(-1+\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}\right)-3\sum_{k=1}^{\infty}\frac{\left(\frac{1}{1-\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}}\right)^k}{k}$$

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=-157+6i\pi\left\lfloor\frac{\arg\left(\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}-x\right)}{2\pi}\right\rfloor+3\log(x)-3\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}-x\right)^k x^{-k}}{k}\quad \text{for } x<0$$

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=$$

$$-157+6i\pi\left\lfloor\frac{\pi-\arg\left(\frac{1}{z_0}\right)-\arg(z_0)}{2\pi}\right\rfloor+3\log(z_0)-3\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}-z_0\right)^k z_0^{-k}}{k}$$

**Integral representations:**

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=$$

$$-157+3\int_1^{\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}}\frac{1}{t}\,dt$$

$$3\log\left(\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}\right)-144-13=$$

$$-157-\frac{3i}{2\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\left(-1+\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1<\gamma<0$$

Thence we obtain the following mathematical connections:

$$\left(3\log\left(\frac{e^{712483536519203/28991029248}}{8589934592\sqrt{3}\,\pi^{5/2}}\right)-157\right)=73492.1452\Rightarrow$$

$$\Rightarrow -3927+2\left(\sqrt[13]{\frac{N\exp\left[\int d\hat{\sigma}\left(-\frac{1}{4u^2}\mathbf{P}_i D\mathbf{P}_i\right)\right]|Bp\rangle_{NS}+}{\int[d\mathbf{X}^\mu]\exp\left\{\int d\hat{\sigma}\left(-\frac{1}{4v^2}D\mathbf{X}^\mu D^2\mathbf{X}^\mu\right)\right\}|\mathbf{X}^\mu,\mathbf{X}^i=0\rangle_{NS}}}\right)=$$

$$-3927+2\sqrt[13]{2.2983717437\times 10^{59}+2.0823329825883\times 10^{59}}$$

$$=73490.8437525....\Rightarrow$$

$$\Rightarrow \left( A(r) \times \frac{1}{B(r)} \left( -\frac{1}{\phi(r)} \right) \times \frac{1}{e^{\Lambda(r)}} \right) \Rightarrow$$

$$\Rightarrow \left( -0.000029211892 \times \frac{1}{0.0003644621} \left( -\frac{1}{0.0005946833} \right) \times \frac{1}{0.00183393} \right) =$$

$= 73491.788325481187105491595720422205480251957265634133987\ldots$

$= 73491.7883254\ldots \Rightarrow$

$$\left( \begin{array}{c} I_{21} \ll \int_{-\infty}^{+\infty} \exp\left(-\left(\frac{t}{H}\right)^2\right) \left| \sum_{\lambda \leq P^{1-\varepsilon_1}} \frac{a(\lambda)}{\sqrt{\lambda}} B(\lambda) \lambda^{-i(T+t)} \right|^2 dt \ll \\ \ll H\left\{ \left( \frac{4}{\varepsilon_2 \log T} \right)^{2r} (\log T)(\log X)^{-2\beta} + (\varepsilon_2^{-2r} (\log T)^{-2r} + \varepsilon_2^{-r} h_1^r (\log T)^{-r}) T^{-\varepsilon_1} \right\} \end{array} \right) /$$

$$/(26 \times 4)^2 - 24 = \left( \frac{7.9313976505275 \times 10^8}{(26 \times 4)^2 - 24} \right) = 73493.30662\ldots$$

Mathematical connections with the boundary state corresponding to the NSNS-sector of N Dp-branes in the limit of u → ∞, with the ratio concerning the general asymptotically flat solution of the equations of motion of the p-brane and with the Karatsuba's equation concerning the zeros of a special type of function connected with Dirichlet series.

(((((((((exp(((((4096*6+35/24(1/(6*4096)+1/(((2*4096^2*6^2)))))))))))))*((1/((sqrt6)*(4096*2Pi)^(5/2))))))))))^1/3571-29

Where 3571 and 29 are Lucas numbers

**Input:**

$$\sqrt[3571]{\exp\left(4096 \times 6 + \frac{35}{24}\left(\frac{1}{6 \times 4096} + \frac{1}{2 \times 4096^2 \times 6^2}\right)\right) \times \frac{1}{\sqrt{6}\,(4096 \times 2\,\pi)^{5/2}}} - 29$$

**Exact result:**

$$\frac{e^{712483536519203/103526965444608}}{2^{33/3571}\sqrt[7142]{3}\,\pi^{5/7142}} - 29$$

**Decimal approximation:**

938.5287976262261246747833953452380177412775621880477333652...

938.528797626… result practically equal to the rest mass of the proton 938.272

**Alternate form:**

$$\frac{e^{712483536519203/103526965444608} - 29\times 2^{33/3571}\sqrt[7142]{3}\,\pi^{5/7142}}{2^{33/3571}\sqrt[7142]{3}\,\pi^{5/7142}}$$

**Series representations:**

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\,\pi)^{5/2}}} - 29 = -29+\frac{e^{712483536519203/103526965444608}}{2^{38/3571}\sqrt[7142]{3}\left(\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}\right)^{5/7142}}$$

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\,\pi)^{5/2}}} - 29 = -29+\frac{\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{712483536519203/103526965444608}}{2^{33/3571}\sqrt[7142]{3}\,\pi^{5/7142}}$$

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\,\pi)^{5/2}}} - 29 = -29+\frac{\left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{712483536519203/103526965444608}}{2^{33/3571}\sqrt[7142]{3}\,\pi^{5/7142}}$$

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}}-29=$$
$$\frac{1}{6\left(\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}\right)^{5/7142}}\left(-174\left(\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}\right)^{5/7142}+\right.$$
$$\left.2^{3533/3571}\times 3^{7141/7142}\left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{712483536519203/103526965444608}\right)$$

**Integral representations:**

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}}-29=$$
$$-29+\frac{e^{712483536519203/103526965444608}}{2^{38/3571}\sqrt[7142]{3}\left(\int_0^1\sqrt{1-t^2}\,dt\right)^{5/7142}}$$

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}}-29=$$
$$-29+\frac{e^{712483536519203/103526965444608}}{2^{71/7142}\sqrt[7142]{3}\left(\int_0^\infty\frac{1}{1+t^2}\,dt\right)^{5/7142}}$$

$$\sqrt[3571]{\frac{\exp\left(4096\times 6+\frac{35}{24}\left(\frac{1}{6\times 4096}+\frac{1}{2\times 4096^2\times 6^2}\right)\right)}{\sqrt{6}\,(4096\times 2\pi)^{5/2}}}-29=$$
$$-29+\frac{e^{712483536519203/103526965444608}}{2^{71/7142}\sqrt[7142]{3}\left(\int_0^1\frac{1}{\sqrt{1-t^2}}\,dt\right)^{5/7142}}$$

Now, we have, from the formula for the coefficients of the '5th order' mock theta function $\psi_1(q)$, for n = 199.596:

sqrt(golden ratio) * exp(Pi*sqrt(199.596/15)) / (2*5^(1/4)*sqrt(199.596))

**Input interpretation:**

$$\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{199.596}{15}}\right)}{2 \sqrt[4]{5} \sqrt{199.596}}$$

$\phi$ is the golden ratio

**Result:**

2855.02...

2855.02…

**Series representations:**

$$\frac{\sqrt{\phi} \exp\left(\pi \sqrt{\frac{199.596}{15}}\right)}{2 \sqrt[4]{5} \sqrt{199.596}} = \frac{\exp\left(\pi \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (13.3064 - z_0)^k z_0^{-k}}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (\phi - z_0)^k z_0^{-k}}{k!}}{2 \sqrt[4]{5} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (199.596 - z_0)^k z_0^{-k}}{k!}}$$

for not $((z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))$

$$\frac{\sqrt{\phi} \exp\left(\pi \sqrt{\frac{199.596}{15}}\right)}{2 \sqrt[4]{5} \sqrt{199.596}} = \left(\exp\left(i \pi \left\lfloor \frac{\arg(\phi - x)}{2 \pi} \right\rfloor\right) \exp\left(\pi \exp\left(i \pi \left\lfloor \frac{\arg(13.3064 - x)}{2 \pi} \right\rfloor\right) \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k (13.3064 - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}\right) \sum_{k=0}^{\infty} \frac{(-1)^k (\phi - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}\right) / \left(2 \sqrt[4]{5} \exp\left(i \pi \left\lfloor \frac{\arg(199.596 - x)}{2 \pi} \right\rfloor\right) \sum_{k=0}^{\infty} \frac{(-1)^k (199.596 - x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\,\exp\left(\pi\sqrt{\frac{199.596}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{199.596}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(13.3064-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(13.3064-z_0)/(2\pi)\rfloor)} \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (13.3064-z_0)^k z_0^{-k}}{k!}\right)\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(199.596-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} z_0^{-1/2\lfloor\arg(199.596-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor} \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) \Bigg/ \left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(199.596-z_0)^k z_0^{-k}}{k!}\right)$$

Now, we have the following interesting expression:

1/((((((((((exp(((((2855.02*6+35/24(1/(6*2855.02)+1/(((2*2855.02^2*6^2)))))))))))))) *((1/((sqrt6)*(2855.02*2Pi)^(5/2))))))))))*0.9895305^64

where 2855.02 is the result of previous equation, while 0.9895305 is a number very near to the dilaton value **0.989117352243**

**Input interpretation:**

$$\frac{1}{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)\times\frac{1}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}}\times 0.9895305^{64}$$

**Result:**

$1.63828\ldots\times 10^{-7429}$

1.63828…*$10^{-7429}$

**Series representations:**

$$\frac{0.989531^{64}}{\frac{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}} = \frac{1.25622\times 10^9\,\pi^{5/2}\sqrt{5}\sum_{k=0}^{\infty}5^{-k}\binom{\frac{1}{2}}{k}}{\exp(17130.1)}$$

$$\frac{0.989531^{64}}{\frac{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}} = \frac{1.25622\times 10^9\,\pi^{5/2}\,\sqrt{5}\,\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}{\exp(17\,130.1)}$$

$$\frac{0.989531^{64}}{\frac{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}} = \frac{6.2811\times 10^8\,\pi^{5/2}\,\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j}5^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\exp(17\,130.1)\sqrt{\pi}}$$

Or:

1/((((((((((exp(((((2855.02*6+35/24(1/(6*2855.02)+1/(((2*2855.02^2*6^2)))))))))))) *((1/((sqrt6)*(2855.02*2Pi)^(5/2)))))))))))*(sqrt10-3)Pi

**Input interpretation:**

$$\frac{1}{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)\times\frac{1}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}}\left(\sqrt{10}-3\right)\pi$$

**Result:**

$1.63806\ldots\times 10^{-7429}$

1.63806…*10$^{-7429}$

**Series representations:**

$$\frac{\left(\sqrt{10}-3\right)\pi}{\frac{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}} = \frac{1}{\exp(17\,130.1)}\,2.46376\times 10^9\,\pi^{7/2}\left(-3\sqrt{5}\sum_{k=0}^{\infty}5^{-k}\binom{\frac{1}{2}}{k}+\sqrt{5}\,\sqrt{9}\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}5^{-k_1}\times 9^{-k_2}\binom{\frac{1}{2}}{k_1}\binom{\frac{1}{2}}{k_2}\right)$$

$$\frac{(\sqrt{10}-3)\pi}{\frac{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}} = -\frac{1}{\exp(17130.1)\sqrt{\pi}^2}\,3.69564\times 10^9\,\pi^{7/2}\left(\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,5^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)\left(\sqrt{\pi}-0.166667\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,9^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)$$

$$\frac{(\sqrt{10}-3)\pi}{\frac{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)}{\sqrt{6}\,(2855.02\times 2\pi)^{5/2}}} = \frac{1}{\exp(17130.1)}\,2.46376\times 10^9\,\pi^{7/2}\left(-3\sqrt{5}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+\sqrt{5}\sqrt{9}\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1+k_2}\,5^{-k_1}\times 9^{-k_2}\left(-\frac{1}{2}\right)_{k_1}\left(-\frac{1}{2}\right)_{k_2}}{k_1!\,k_2!}\right)$$

We note that the results $1.63828\ldots*10^{-7429}$ and $1.63806\ldots*10^{-7429}$ are connected with the following expression concerning the Ramanujan's formula to obtain a highly precise golden ratio:

((((1/(((1/32(-1+sqrt(5))^5+5*(e^((-sqrt(5)*Pi))^5)))-(-1.6382898797095665677239458827012056245798314722584 × 10^-7429)))^1/5

**Input interpretation:**

$$\sqrt[5]{\frac{1}{\left(\frac{1}{32}(-1+\sqrt{5})^5+5\,e^{\left(-\sqrt{5}\,\pi\right)^5}\right)--\frac{1.6382898797095665677239458827012056245798314722584}{10^{7429}}}}$$

**Result:**

1.6180339887498948482045868343656381177203091798057628621354...

The result, thence, is:

1.6180339887498948482045868343656381177203091798057628

Indeed, from the previous formula, we obtain:

[((1/(1/32(-1+sqrt(5))^5+5*(e^((-sqrt(5)*Pi))^5))+
1/((((((((((exp((((((2855.02*6+35/24(1/(6*2855.02)+1/(((2*2855.02^2*6^2)))))))))))))
*((1/((sqrt6)*(2855.02*2Pi)^(5/2)*0.9895305^64))))))))))]^1/5

**Input interpretation:**

$$\left(\frac{1}{\frac{1}{32}\left(-1+\sqrt{5}\right)^5+5\,e^{\left(-\sqrt{5}\,\pi\right)^5}}+\frac{1}{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)\times\frac{1}{\sqrt{6}\,(2855.02\times 2\,\pi)^{5/2}\times 0.9895305^{64}}}\right)^{\wedge}(1/5)$$

**Result:**

1.618033988749894848204586834365638117720309179805762862135...

1.6180339887... = golden ratio

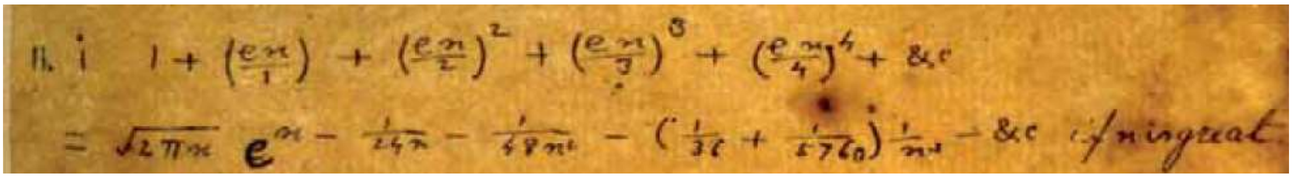
Thence, we have the following mathematical connection:

$$\left(\sqrt[5]{\frac{1}{\left(\frac{1}{32}\left(-1+\sqrt{5}\right)^5+5\,e^{\left(-\sqrt{5}\,\pi\right)^5}\right)--\frac{1.6382898797095665677239458827012056245798314722584}{10^{7429}}}}\right)=$$

$$=\left(\left(\frac{1}{\frac{1}{32}\left(-1+\sqrt{5}\right)^5+5\,e^{\left(-\sqrt{5}\,\pi\right)^5}}+\frac{1}{\exp\left(2855.02\times 6+\frac{35}{24}\left(\frac{1}{6\times 2855.02}+\frac{1}{2\times 2855.02^2\times 6^2}\right)\right)\times\frac{1}{\sqrt{6}\,(2855.02\times 2\,\pi)^{5/2}\times 0.9895305^{64}}}\right)^{\wedge}(1/5)\right)=$$

= 1.6180339887...

Now, we have that:



11. i $1 + \left(\frac{e\,n}{1}\right) + \left(\frac{e\,n}{2}\right)^2 + \left(\frac{e\,n}{3}\right)^3 + \left(\frac{e\,n}{4}\right)^4 + \&c$

$= \sqrt{2\pi n}\; e^{n} - \frac{1}{24n} - \frac{1}{48n^2} - \left(\frac{1}{36} + \frac{1}{5760}\right)\frac{1}{n^3} - \&c$ if n is great

4096-1/(24*4096)-1/(48*4096^2)-(1/36+1/5760)*1/4096^3

**Input:**

$$4096 - \frac{1}{24 \times 4096} - \frac{1}{48 \times 4096^2} - \left(\frac{1}{36} + \frac{1}{5760}\right) \times \frac{1}{4096^3}$$

**Exact result:**

$$\frac{1\,621\,295\,861\,826\,355\,039}{395\,824\,185\,999\,360}$$

**Decimal approximation:**

4095.99998982623178815427106908626026577419704861111111111...

4095.9999898262317881542 71..... ≈ 4096 $= 64^2$

We have also that:

sqrt(2Pi*4095.9999898262317881542 71) * e^(4095.9999898262317881542 71)

**Input interpretation:**

$$\sqrt{2\pi \times 4095.999989826231788154271}\; e^{4095.999989826231788154271}$$

**Result:**

$1.18977096136644293478... \times 10^{1781}$

$1.1897709613664...*10^{1781}$

**Series representations:**

$$\sqrt{2\pi\,4095.99998982623178815427100000}\; e^{4095.99998982623178815427100000} = e^{4095.99998982623178815427100000}\sqrt{-1+8191.99997965246357630854200000\,\pi}\sum_{k=0}^{\infty}(-1+8191.99997965246357630854200000\,\pi)^{-k}\binom{\frac{1}{2}}{k}$$

$$\sqrt{2\pi\,4095.99998982623178815427100000}\; e^{4095.99998982623178815427100000} = e^{4095.99998982623178815427100000}\sqrt{-1+8191.99997965246357630854200000\,\pi}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+8191.99997965246357630854200000\,\pi)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{2\pi\,4095.99998982623178815427100000}\; e^{4095.99998982623178815427100000} = e^{4095.99998982623178815427100000}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(8191.99997965246357630854200000\,\pi-z_0)^k z_0^{-k}}{k!}$$

for not $((z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0))$

log ((((sqrt(2Pi*4095.999989826) * e^(4095.999989826))))

**Input interpretation:**

$$\log\left(\sqrt{2\pi\times4095.999989826}\; e^{4095.999989826}\right)$$

$\log(x)$ is the natural logarithm

**Result:**

4101.077811441...

4101.077811441… (about equal to $64^2 + 5$, where 5 is a Fibonacci number)

**Alternative representations:**

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\; e^{4095.9999898260000}\right) = \log_e\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)$$

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\; e^{4095.9999898260000}\right) = \log(a)\log_a\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)$$

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right) = -\text{Li}_1\left(1 - e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)$$

## Series representations:

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right) = \log\left(e^{4095.9999898260000}\sqrt{-1+8191.9999796520000\,\pi}\sum_{k=0}^{\infty}(-1+8191.9999796520000\,\pi)^{-k}\binom{\frac{1}{2}}{k}\right)$$

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right) = \log\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right) - \sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)^{-k}}{k}$$

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right) = \log\left(e^{4095.9999898260000}\sqrt{-1+8191.9999796520000\,\pi}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+8191.9999796520000\,\pi)^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

## Integral representations:

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right) = \int_1^{e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}}\frac{1}{t}\,dt$$

$$\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right) = \frac{1}{2i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\Gamma(-s)^2\,\Gamma(1+s)\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)^{-s}}{\Gamma(1-s)}\,ds$$

for $-1 < \gamma < 0$

And:

2*sqrt(((log ((((sqrt(2Pi*4095.999989826) * e^(4095.999989826)))))))-Pi+1/golden ratio

**Input interpretation:**

$$2\sqrt{\log\left(\sqrt{2\pi\times 4095.999989826}\ e^{4095.999989826}\right)}-\pi+\frac{1}{\phi}$$

log(x) is the natural logarithm

$\phi$ is the golden ratio

**Result:**

125.5557575645...

125.5557575645…. result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18

**Alternative representations:**

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=-\pi+\frac{1}{\phi}+2\sqrt{\log_e\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=-\pi+\frac{1}{\phi}+2\sqrt{\log(a)\log_a\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\ e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=-\pi+\frac{1}{\phi}+2\sqrt{-\text{Li}_1\left(1-e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}$$

**Series representations:**

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{\left(\log\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)^{-k}}{k}\right)}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)\right)^{-k}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

## Integral representations:

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{\int_1^{e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}}\frac{1}{t}\,dt}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{\left(\frac{1}{2i\pi}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\Gamma(-s)^2\,\Gamma(1+s)\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)^{-s}}{\Gamma(1-s)}\,ds\right)}\quad\text{for } -1<\gamma<0$$

And:

2*sqrt(((log ((((sqrt(2Pi*4095.999989826) * e^(4095.999989826)))))))))-Pi+11+golden ratio

**Input interpretation:**

$$2\sqrt{\log\left(\sqrt{2\,\pi\times 4095.999989826}\;e^{4095.999989826}\right)}-\pi+11+\phi$$

log(x) is the natural logarithm

$\phi$ is the golden ratio

**Result:**

137.5557575645...

137.5557575645…. result very near to the rest mass of Pion meson 139.57

**Alternative representations:**

$$2\sqrt{\log\left(\sqrt{2\,\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{\log_e\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}$$

$$2\sqrt{\log\left(\sqrt{2\,\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{\log(a)\log_a\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}$$

$$2\sqrt{\log\left(\sqrt{2\,\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{-\text{Li}_1\left(1-e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}$$

## Series representations:

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{\left(\log\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)^{-k}}{k}\right)}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)\right)^{-k}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\log\left(e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

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

## Integral representations:

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$
$$11+\phi-\pi+2\sqrt{\int_1^{e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}}\frac{1}{t}\,dt}$$

$$2\sqrt{\log\left(\sqrt{2\pi\,4095.9999898260000}\;e^{4095.9999898260000}\right)}-\pi+11+\phi=$$

$$11+\phi-\pi+2\sqrt{\left(\frac{1}{2\,i\,\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{\Gamma(-s)^2\,\Gamma(1+s)\left(-1+e^{4095.9999898260000}\sqrt{8191.9999796520000\,\pi}\right)^{-s}}{\Gamma(1-s)}\,ds\right)}\quad\text{for } -1<\gamma<0$$

## Example of Ramanujan mathematics applied to the physics

From:

THE
MATHEMATICAL THEORY
OF BLACK HOLES

S. CHANDRASEKHAR
*University of Chicago*

Clarendon Press • Oxford
Oxford University Press • New York
1983

**20. The geodesics in the Schwarzschild space-time: the null geodesics**

(c) *The geodesics of the first kind*

We now consider the case when all the roots of the cubic equation $f(u) = 0$ are real and the two positive roots are distinct. Let the roots be

$$u_1 = \frac{P - 2M - Q}{4MP} (< 0), \quad u_2 = \frac{1}{P}, \quad \text{and} \quad u_3 = \frac{P - 2M + Q}{4MP}, \tag{246}$$

where $P$ denotes the perihelion distance and $Q$ is a constant to be specified presently. The sum of the roots has been arranged to be equal to $1/2M$ as required (cf. equation (226)). Also, it should be noted that the ordering of the roots, $u_1 < u_2 < u_3$, requires that

$$Q + P - 6M > 0. \tag{247}$$

Inserting these various relations in equation (261), we find that

$$\varphi_\infty = \tfrac{1}{2}\lg\left[\frac{6^4\sqrt{3}}{2}\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right] - \tfrac{1}{2}\lg\frac{\delta D}{M}, \tag{265}$$

or

$$\frac{\delta D}{M} \to \frac{6^4\sqrt{3}}{2}\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}e^{-2\varphi_\infty}. \tag{266}$$

Letting

$$\varphi_\infty = \tfrac{1}{2}(\pi + \Theta), \tag{267}$$

we obtain

$$\frac{\delta D}{M} = 648\sqrt{3}\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}e^{-\pi}e^{-\Theta} = 3.4823\,e^{-\Theta}; \tag{268}$$

and this is the required relation.

Now, we have that:

(((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * exp(-Pi)

**Input:**

$$\left(648\sqrt{3}\times\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)\exp(-\pi)$$

**Exact result:**

$$\frac{648\sqrt{3}\,(\sqrt{3}-1)^2\,e^{-\pi}}{(1+\sqrt{3})^2}$$

**Decimal approximation:**

3.482283975298158546034987960269648388256072002340790092133...

3.482283975…

**Property:**

$\frac{648\sqrt{3}\,(-1+\sqrt{3})^2\,e^{-\pi}}{(1+\sqrt{3})^2}$ is a transcendental number

**Alternate forms:**

$$\left(4536\sqrt{3}-7776\right)e^{-\pi}$$

$$648\left(7\sqrt{3}-12\right)e^{-\pi}$$

$$\frac{648\,(2\sqrt{3}-3)\,e^{-\pi}}{2+\sqrt{3}}$$

**Series representations:**

$$\frac{\exp(-\pi)\,648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2}=\frac{648\exp(-\pi)\sqrt{2}\left(\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2}$$

$$\frac{\exp(-\pi)\,648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2}=\frac{648\exp(-\pi)\sqrt{2}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}$$

$$\frac{\exp(-\pi)\,648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2} = \left(324\exp(-\pi)\left(2\sqrt{\pi}-\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,2^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)^2 \sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,2^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right) \Bigg/ \left(\sqrt{\pi}\left(2\sqrt{\pi}+\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\,2^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)^2\right)$$

For Θ = π/2, we have:

(((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * exp(-Pi) * exp(-1/2Pi)

**Input:**

$$\left(648\sqrt{3}\times\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)$$

**Exact result:**

$$\frac{648\sqrt{3}\,(\sqrt{3}-1)^2\,e^{-(3\pi)/2}}{(1+\sqrt{3})^2}$$

**Decimal approximation:**

0.723895717518028245408591528990315772030811596958014750221...

0.7238957175…

**Property:**

$$\frac{648\sqrt{3}\,(-1+\sqrt{3})^2\,e^{-(3\pi)/2}}{(1+\sqrt{3})^2}$$ is a transcendental number

**Alternate forms:**

$$\left(4536\sqrt{3}-7776\right)e^{-(3\pi)/2}$$

$$\frac{648\,(2\sqrt{3}-3)\,e^{-(3\pi)/2}}{2+\sqrt{3}}$$

$$\frac{2592\sqrt{3}\,e^{-(3\pi)/2}}{(1+\sqrt{3})^2}-\frac{3888\,e^{-(3\pi)/2}}{(1+\sqrt{3})^2}$$

**Series representations:**

$$\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2} = \frac{648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\sqrt{2}\left(\sum_{k=0}^{\infty} 2^{-k}\binom{\frac{1}{2}}{k}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty} 2^{-k}\binom{\frac{1}{2}}{k}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty} 2^{-k}\binom{\frac{1}{2}}{k}\right)^2}$$

$$\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2} = \frac{648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\sqrt{2}\left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}$$

$$\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2} = \left(324\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(2\sqrt{\pi}-\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 2^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)^2 \sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 2^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right) \Big/ \left(\sqrt{\pi}\left(2\sqrt{\pi}+\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 2^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)^2\right)$$

For Θ = -2π, we have:

(((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * e^(-Pi)  e^-(-2Pi)

**Input:**

$$\left(648\sqrt{3}\times\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)e^{-\pi}\,e^{-(-2\pi)}$$

**Exact result:**

$$\frac{648\sqrt{3}\,(\sqrt{3}-1)^2\,e^{\pi}}{(1+\sqrt{3})^2}$$

**Decimal approximation:**

1864.7340109397698709947987006584833577026327878768595246663...

1864.73401093…. result practically equal to the rest mass of D meson 1864.84

**Property:**

$$\frac{648\sqrt{3}\,(-1+\sqrt{3})^2\,e^{\pi}}{(1+\sqrt{3})^2}$$ is a transcendental number

**Alternate forms:**

$$\left(4536\sqrt{3}-7776\right)e^{\pi}$$

$$648\left(7\sqrt{3}-12\right)e^{\pi}$$

$$-\frac{648\sqrt{3}\,(\sqrt{3}-2)\,e^{\pi}}{2+\sqrt{3}}$$

**Series representations:**

$$\frac{\left(e^{-\pi}\,e^{-(-2\pi)}\right)648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2}=\frac{648\,e^{\pi}\sqrt{2}\left(\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2}$$

$$\frac{\left(e^{-\pi}\,e^{-(-2\pi)}\right)648\left(\sqrt{3}\,(\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2}=\frac{648\,e^{\pi}\sqrt{2}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}$$

$$\frac{(e^{-\pi} e^{-(-2\pi)})\, 648 \left(\sqrt{3} (\sqrt{3}-1)^2\right)}{(\sqrt{3}+1)^2} =$$

$$\frac{324 e^{\pi} \left(2\sqrt{\pi} - \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 2^{-s}\, \Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)^2 \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 2^{-s}\, \Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}\left(2\sqrt{\pi} + \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 2^{-s}\, \Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)\right)^2}$$

Now, we have, from the formula for the coefficients of the '5th order' mock theta function $\psi_1(q)$, for n = 183.638:

a(n) ~ sqrt(phi) * exp(Pi*sqrt(n/15)) / (2*5^(1/4)*sqrt(n))

sqrt(golden ratio) * exp(Pi*sqrt(183.638/15)) / (2*5^(1/4)*sqrt(183.638))

**Input interpretation:**

$$\sqrt{\phi} \times \frac{\exp\left(\pi \sqrt{\frac{183.638}{15}}\right)}{2\sqrt[4]{5}\sqrt{183.638}}$$

$\phi$ is the golden ratio

**Result:**

1864.67...

1864.67…. result practically equal to the rest mass of D meson 1864.84

**Series representations:**

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{183.638}{15}}\right)}{2\sqrt[4]{5}\sqrt{183.638}} = \frac{\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (12.2425-z_0)^k z_0^{-k}}{k!}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (\phi-z_0)^k z_0^{-k}}{k!}}{2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (183.638-z_0)^k z_0^{-k}}{k!}}$$

for not $((z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{183.638}{15}}\right)}{2\sqrt[4]{5}\sqrt{183.638}} = \left(\exp\left(i\pi\left\lfloor\frac{\arg(\phi-x)}{2\pi}\right\rfloor\right)\right.$$
$$\exp\left(\pi\exp\left(i\pi\left\lfloor\frac{\arg(12.2425-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(12.2425-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k(\phi-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) /$$
$$\left(2\sqrt[4]{5}\exp\left(i\pi\left\lfloor\frac{\arg(183.638-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(183.638-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

$$\frac{\sqrt{\phi}\exp\left(\pi\sqrt{\frac{183.638}{15}}\right)}{2\sqrt[4]{5}\sqrt{183.638}} = \left(\exp\left(\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(12.2425-z_0)/(2\pi)\rfloor}\right.\right.$$
$$\left.z_0^{1/2(1+\lfloor\arg(12.2425-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(12.2425-z_0)^k z_0^{-k}}{k!}\right)$$
$$\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(183.638-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}$$
$$\left.z_0^{-1/2\lfloor\arg(183.638-z_0)/(2\pi)\rfloor+1/2\lfloor\arg(\phi-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(\phi-z_0)^k z_0^{-k}}{k!}\right) /$$
$$\left(2\sqrt[4]{5}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(183.638-z_0)^k z_0^{-k}}{k!}\right)$$

From the previous expression

(((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * exp(-Pi) * exp(-1/2Pi)

We obtain:

(((((((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * exp(-Pi) * exp(-1/2Pi)))))^1/32

**Input:**

$$\sqrt[32]{\left(648\sqrt{3}\times\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)}$$

**Exact result:**

$$2^{3/32} \times 3^{9/64} \sqrt[16]{\frac{\sqrt{3}-1}{1+\sqrt{3}}}\, e^{-(3\pi)/64}$$

**Decimal approximation:**

0.989953681884378275892102729399204991201740784216401186604...

0.9899536818…. result practically equal to the dilaton value **0. 989117352243 =** $\boldsymbol{\phi}$ (see Appendix)

**Property:**

$$2^{3/32} \times 3^{9/64} \sqrt[16]{\frac{-1+\sqrt{3}}{1+\sqrt{3}}}\, e^{-(3\pi)/64} \text{ is a transcendental number}$$

**Alternate forms:**

$$2^{3/32} \times 3^{9/64} \sqrt[16]{2-\sqrt{3}}\, e^{-(3\pi)/64}$$

$$2^{3/32} \sqrt[8]{3} \sqrt[32]{7\sqrt{3}-12}\, e^{-(3\pi)/64}$$

And:

4 log base 0.989953681884378 (((((((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * exp(-Pi) * exp(-1/2Pi))))))-Pi+1/golden ratio

**Input interpretation:**

$$4 \log_{0.989953681884378}\left(\left(648\sqrt{3} \times \frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right) - \pi + \frac{1}{\phi}$$

$\log_b(x)$ is the base- $b$ logarithm

$\phi$ is the golden ratio

**Result:**

125.4764413352...

125.4764413… result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18

## Alternative representation:

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)-\pi+\frac{1}{\phi}=$$

$$-\pi+\frac{1}{\phi}+\frac{4\log\left(\frac{648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)}{\log(0.9899536818843780000)}$$

## Series representations:

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)-\pi+\frac{1}{\phi}=$$

$$\frac{1}{\phi}-\pi-\frac{4\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^k}{k}}{\log(0.9899536818843780000)}$$

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)-\pi+\frac{1}{\phi}=$$

$$-\frac{1}{\phi}\left(-1+\phi\pi-4\phi\log_{0.9899536818843780000}\left(\left(648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right.\right.\right.$$
$$\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$
$$\left(-1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2\Bigg)\Bigg/$$
$$\left.\left.\left.\left(1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2\right)\right)\right)$$

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

$$4\log_{0.98995368188437800000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)-\pi+\frac{1}{\phi}=$$

$$-\frac{1}{\phi}\left(-1+\phi\pi-4\phi\log_{0.98995368188437800000}\left(\left(648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(3-z_0)/(2\pi)\rfloor}z_0^{1/2(1+\lfloor\arg(3-z_0)/(2\pi)\rfloor)}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)\left(-1+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(3-z_0)/(2\pi)\rfloor}z_0^{1/2(1+\lfloor\arg(3-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)^2\right)\Big/\left(1+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(3-z_0)/(2\pi)\rfloor}z_0^{1/2(1+\lfloor\arg(3-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)^2\right)\right)$$

4 log base 0.989953681884378 (((((((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2))) * exp(-Pi) * exp(-1/2Pi))))))+11+1/golden ratio

Where 11 is a Lucas number

**Input interpretation:**

$$4\log_{0.989953681884378}\left(\left(648\sqrt{3}\times\frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)+11+\frac{1}{\phi}$$

$\log_b(x)$ is the base- $b$ logarithm

$\phi$ is the golden ratio

**Result:**

139.6180339887...

139.61803398… result practically equal to the rest mass of Pion meson 139.57

## Alternative representation:

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)+11+\frac{1}{\phi}=$$

$$11+\frac{1}{\phi}+\frac{4\log\left(\frac{648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)}{\log(0.9899536818843780000)}$$

## Series representations:

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)+11+\frac{1}{\phi}=$$

$$11+\frac{1}{\phi}-\frac{4\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^k}{k}}{\log(0.9899536818843780000)}$$

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)+11+\frac{1}{\phi}=$$

$$\frac{1}{\phi}\left(1+11\phi+4\phi\log_{0.9899536818843780000}\left(\left(648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\left(-1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2\right)\Big/\left(1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2\right)\right)$$

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

$$4\log_{0.9899536818843780000}\left(\frac{\left(\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\right)648\left(\sqrt{3}\left(\sqrt{3}-1\right)^2\right)}{\left(\sqrt{3}+1\right)^2}\right)+11+\frac{1}{\phi}=$$

$$\frac{1}{\phi}\left(1+11\phi+4\phi\log_{0.9899536818843780000}\left(\left(648\exp(-\pi)\exp\left(-\frac{\pi}{2}\right)\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(3-z_0)/(2\pi)\rfloor}z_0^{1/2(1+\lfloor\arg(3-z_0)/(2\pi)\rfloor)}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)\left(-1+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(3-z_0)/(2\pi)\rfloor}z_0^{1/2(1+\lfloor\arg(3-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)^2\right)\Big/\left(1+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(3-z_0)/(2\pi)\rfloor}z_0^{1/2(1+\lfloor\arg(3-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}\right)^2\right)\right)$$

Now, from

$$\varphi_\infty=\tfrac{1}{2}\lg\left[\frac{6^4\sqrt{3}}{2}\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right]-\tfrac{1}{2}\lg\frac{\delta D}{M}$$

We obtain:

1/2ln(((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2)))-1/2 ln 1864.7340109397

**Input interpretation:**

$$\frac{1}{2}\log\left(648\sqrt{3}\times\frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{1}{2}\log(1864.7340109397)$$

log(x) is the natural logarithm

**Result:**

−1.5707963267949...

-1.5707963267949…

**Alternative representations:**

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$-\frac{1}{2}\log(a)\log_a(1864.73401093970000)+\frac{1}{2}\log(a)\log_a\left(\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)$$

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$-\frac{\log_e(1864.73401093970000)}{2}+\frac{1}{2}\log_e\left(\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)$$

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$\frac{\mathrm{Li}_1(-1863.73401093970000)}{2}-\frac{1}{2}\mathrm{Li}_1\left(1-\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)$$

# Series representations:

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$-\frac{\log(1863.73401093970000)}{2}+\frac{1}{2}\log\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)+$$
$$\sum_{k=1}^{\infty}\frac{(-1)^k\left(e^{-7.53033728706948593\,k}-\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^{-k}\right)}{2k}$$

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$\frac{1}{2}\left(-\log(1864.73401093970000)+\log\left(\frac{648\sqrt{2}\left(\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)\left(-1+\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2}{\left(1+\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{\frac{1}{2}}{k}\right)^2}\right)\right)$$

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\,(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$-i\left(\pi\left\lfloor\frac{\arg(1864.73401093970000-x)}{2\pi}\right\rfloor\right)+i\pi\left\lfloor\frac{\arg\left(-x+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)}{2\pi}\right\rfloor+$$
$$\sum_{k=1}^{\infty}\frac{(-1)^k x^{-k}\left((1864.73401093970000-x)^k-\left(-x+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^k\right)}{2k}\quad\text{for } x<0$$

**Integral representations:**

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\,(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$\int_1^{1864.73401093970000}\left(\left(-1.4388379714040895-2.3776759428081790\sqrt{3}-2.4388379714040895\sqrt{3}^2+0.50000000000000000\sqrt{3}^3\right)\Big/\left(t\left(2.87767594280817901+4.75535188561635802\sqrt{3}+4.87767594280817901\sqrt{3}^2-1.00000000000000000\sqrt{3}^3+t\left(-0.00154320987654320988+0.99691358024691358\sqrt{3}-2.00154320987654321\sqrt{3}^2+\sqrt{3}^3\right)\right)\right)\right)dt$$

$$\frac{1}{2}\log\left(\frac{648\sqrt{3}\,(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}=$$
$$\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\Gamma(-s)^2\,\Gamma(1+s)\left(-e^{-7.53033728706948593\,s}+\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^{-s}\right)}{4i\pi\,\Gamma(1-s)}\,ds\quad\text{for } -1<\gamma<0$$

1/10^27(((((29+7)/10^3+1-1/(((1/2ln(((648*sqrt(3) (sqrt3-1)^2/(sqrt3+1)^2)))-1/2 ln 1864.7340109397)))))))

**Input interpretation:**

$$\frac{1}{10^{27}}\left(\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(648\sqrt{3}\times\frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{1}{2}\log(1864.7340109397)}\right)$$

log(x) is the natural logarithm

**Result:**

$1.67261977236759\ldots\times 10^{-27}$

$1.672619772367\ldots * 10^{-27}$ result practically equal to the proton mass

## Alternative representations:

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}}=\frac{1-\frac{1}{-\frac{\log_e(1864.73401093970000)}{2}+\frac{1}{2}\log_e\left(\frac{648(-1+\sqrt{3})^2\sqrt{3}}{(1+\sqrt{3})^2}\right)}+\frac{36}{10^3}}{10^{27}}$$

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}}=\frac{1-\frac{1}{-\frac{1}{2}\log(a)\log_a(1864.73401093970000)+\frac{1}{2}\log(a)\log_a\left(\frac{648(-1+\sqrt{3})^2\sqrt{3}}{(1+\sqrt{3})^2}\right)}+\frac{36}{10^3}}{10^{27}}$$

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}}=\frac{1-\frac{1}{\frac{\text{Li}_1(-1863.73401093970000)}{2}-\frac{1}{2}\text{Li}_1\left(1-\frac{648(-1+\sqrt{3})^2\sqrt{3}}{(1+\sqrt{3})^2}\right)}+\frac{36}{10^3}}{10^{27}}$$

## Series representations:

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{259^{10^{27}}} =$$

$$\frac{259^{10^{27}}}{250\,000\,000\,000\,000\,000\,000\,000\,000\,000} +$$

$$1 \Bigg/ \Bigg(500\,000\,000\,000\,000\,000\,000\,000\,000 \Bigg(\log(1863.73401093970000) - \log\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right) + \sum_{k=1}^{\infty}\frac{(-1)^k\left(-e^{-7.53033728706948593\,k}+\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^{-k}\right)}{k}\Bigg)\Bigg)$$

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}} =$$

$$\left(500+259\log(1863.73401093970000)-259\log\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)-259\sum_{k=1}^{\infty}\frac{(-0.000536557252338705323)^k}{k}+259\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^{-k}}{k}\right)\Bigg/$$

$$\left(250\,000\,000\,000\,000\,000\,000\,000\,000\,000\left(\log(1863.73401093970000)-\log\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)-\sum_{k=1}^{\infty}\frac{(-0.000536557252338705323)^k}{k}+\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^{-k}}{k}\right)\right)$$

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}} =$$

$$\frac{259}{250\,000\,000\,000\,000\,000\,000\,000\,000\,000} + 1\Bigg/\Bigg(500\,000\,000\,000\,000\,000\,000\,000\,000 \Bigg(2 i \pi \left\lfloor \frac{\arg(1864.73401093970000 - x)}{2\pi} \right\rfloor - 2 i \pi \left\lfloor \frac{\arg\left(-x + \frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)}{2\pi} \right\rfloor + \sum_{k=1}^{\infty} \frac{1}{k}(-1)^{1+k} x^{-k} \left((1864.73401093970000 - x)^k - \left(-x + \frac{648\left(-1+\sqrt{3}\right)^2\sqrt{3}}{\left(1+\sqrt{3}\right)^2}\right)^k\right)\Bigg)\Bigg) \quad \text{for } x < 0$$

**Integral representations:**

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}+1\right)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}} =$$

$$\frac{259}{250\,000\,000\,000\,000\,000\,000\,000\,000\,000} + 1\Bigg/\Bigg(500\,000\,000\,000\,000\,000\,000\,000\,000 \int_1^{1864.73401093970000} \Big(\Big(2.877675942808179 + 4.755351885616358\sqrt{3} + 4.877675942808179\sqrt{3}^2 - 1.0000000000000000\sqrt{3}^3\Big)\Big/ \Big(t\Big(2.87767594280817901 + 4.75535188561635802\sqrt{3} + 4.87767594280817901\sqrt{3}^2 - 1.00000000000000000\sqrt{3}^3 + t\Big(-0.00154320987654320988 + 0.99691358024691358\sqrt{3} - 2.00154320987654321\sqrt{3}^2 + \sqrt{3}^3\Big)\Big)\Big)\Big) dt\Bigg)$$

$$\frac{\frac{29+7}{10^3}+1-\frac{1}{\frac{1}{2}\log\left(\frac{648\sqrt{3}(\sqrt{3}-1)^2}{(\sqrt{3}+1)^2}\right)-\frac{\log(1864.73401093970000)}{2}}}{10^{27}} =$$

$$\frac{259}{250\,000\,000\,000\,000\,000\,000\,000\,000\,000} - 1\bigg/\left(1\,000\,000\,000\,000\,000\,000\,000\,000\,000 \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{1}{4\,i\,\pi\,\Gamma(1-s)}\, e^{-7.53033728706948593\,s}\,\Gamma(-s)^2\,\Gamma(1+s) \left(-1+\frac{648(-1+\sqrt{3})^2\sqrt{3}}{(1+\sqrt{3})^2}\right)^{-s} \left(1863.73401093970000^s - \left(-1+\frac{648(-1+\sqrt{3})^2\sqrt{3}}{(1+\sqrt{3})^2}\right)^s\right) ds\right) \quad \text{for } -1<\gamma<0$$

Now, we have:

$$\frac{1}{128\,M^7}\left(\frac{1}{168}p^4-\frac{53}{1386}p^3+\frac{263}{2772}p^2-\frac{147}{1430}p+\frac{444}{10010}\right);$$

where $p = 2(n+1)$.

For M = 0.13957 GeV (Pion mass) and p = 4, where 4 is a Lucas number, we obtain:

1/(128*(0.13957)^7) * (4^4/168-53*4^3/1386+263*4^2/2772-147*4/1430+444/10010)

**Input:**

$$\frac{1}{128\times 0.13957^7}\left(\frac{4^4}{168}-53\times\frac{4^3}{1386}+263\times\frac{4^2}{2772}-147\times\frac{4}{1430}+\frac{444}{10\,010}\right)$$

**Result:**

1724.157365562245382561686714534246669305286397683490981174...

1724.1573655... result in the range of the mass of candidate "glueball" $f_0(1710)$ ("glueball" =1760 ± 15 MeV).

$$\frac{1}{512M^9}\left(\frac{14}{6435}p^5-\frac{41}{2574}p^4+\frac{56}{1155}p^3-\frac{2557}{34320}p^2+\frac{1203}{19448}p-\frac{723}{38896}\right)$$

1/(512*0.13957^9) * (14*4^5/6435-41*4^4/2574+56*4^3/1155-2557*4^2/34320+1203*4/19448-723/38896)

**Input:**

$$\frac{1}{512\times 0.13957^9}\left(14\times\frac{4^5}{6435}-41\times\frac{4^4}{2574}+56\times\frac{4^3}{1155}-2557\times\frac{4^2}{34320}+1203\times\frac{4}{19448}-\frac{723}{38896}\right)$$

**Result:**

28175.357257397145701606081725167579664799326660036939553 17...

28175.357257...

$$\frac{1}{26880M^5}(16p^3-83p^2+150p-87);$$

1/(26880*0.13957^5) * (16*4^3-83*4^2+150*4-87)

**Input:**

$$\frac{1}{26880\times 0.13957^5}\left(16\times 4^3-83\times 4^2+150\times 4-87\right)$$

**Result:**

146.81033485700255937099613401497698250687459925382515183 66...

146.810334857...

$$\frac{1}{480M^3}(5p^2-18p+18);$$

1/(480*0.13957^3) * (5*4^2-18*4+18)

**Input:**

$$\frac{1}{480\times 0.13957^3}\left(5\times 4^2-18\times 4+18\right)$$

**Result:**

19.923052303474508898907563102793689936025506357219331357 62...

19.9230523....

$$\frac{1}{4\boldsymbol{M}}(2p-3);$$

1/(4*0.13957) * (2*4-3)

**Input:**

$$\frac{1}{4\times 0.13957}(2\times 4-3)$$

**Result:**

8.956079386687683599627427097513792362255499032743426237730...

8.956079386.....

The results are:

1724.1573655... 28175.357257... 146.810334857... 19.9230523.... 8.956079386.....

From the sum, we obtained:

1724.1573655 + 28175.357257 + 146.810334857 + 19.9230523 + 8.956079386

**Input interpretation:**

1724.1573655 + 28 175.357257 + 146.810334857 + 19.9230523 + 8.956079386

**Result:**

30075.204089043

30075.204....

From the following division, we obtain:

(28175.357257 *1/ 1724.1573655 *1/ 146.810334857 *1/ 19.9230523 *1/ 8.956079386)

**Input interpretation:**

$$28175.357257\times\frac{1}{1724.1573655}\times\frac{1}{146.810334857}\times\frac{1}{19.9230523}\times\frac{1}{8.956079386}$$

**Result:**

0.000623824017094414600450836799330692289699942035432340809...

0.000623824....

From the inversion, we obtain:

1/(28175.357257 *1/ 1724.1573655 *1/ 146.810334857 *1/ 19.9230523 *1/ 8.956079386)

**Input interpretation:**

$$\frac{1}{28175.357257\times\frac{1}{1724.1573655}\times\frac{1}{146.810334857}\times\frac{1}{19.9230523}\times\frac{1}{8.956079386}}$$

**Result:**

1603.016191421581427780632032179166025518481680347482665461...

1603.0161914...

From the previous expression, we obtain also:

(28175.357257 *1/ 1724.1573655 *1/ 146.810334857 *1/ 19.9230523 *1/ 8.956079386)^1/4096

**Input interpretation:**

$$\left(28175.357257\times\frac{1}{1724.1573655}\times\frac{1}{146.810334857}\times\frac{1}{19.9230523}\times\frac{1}{8.956079386}\right)\hat{}\,(1/4096)$$

**Result:**

0.9981999515620...

0.9981999515620….. result very near to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5 \sqrt[4]{5^3}}-1}}-\varphi+1} = 1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\dots}}}} \approx 0.9991104684$$

and to the dilaton value **0.989117352243** = $\boldsymbol{\phi}$ (see Appendix)

1/32 log base 0.998199915620 ((((28175.357257 *1/ 1724.1573655 *1/ 146.810334857 *1/ 19.9230523 *1/ 8.956079386))))-Pi+1/golden ratio

**Input interpretation:**

$$\frac{1}{32}\log_{0.998199915620}\left(28\,175.357257\times\frac{1}{1724.1573655}\times\frac{1}{146.810334857}\times\frac{1}{19.9230523}\times\frac{1}{8.956079386}\right)-\pi+\frac{1}{\phi}$$

$\log_b(x)$ is the base- $b$ logarithm

$\phi$ is the golden ratio

**Result:**

125.473883…

125.473883… result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18

**Alternative representation:**

$$\frac{1}{32}\log_{0.9981999156200000}\left(\frac{28\,175.3572570000}{1724.15736550000\times 146.8103348570000\,(19.9231\times 8.95608)}\right)-\pi+\frac{1}{\phi} = -\pi+\frac{1}{\phi}+\frac{\log\left(\frac{28\,175.3572570000}{8.95608\times 19.9231\times 146.8103348570000\times 1724.15736550000}\right)}{32\log(0.9981999156200000)}$$

**Series representations:**

$$\frac{1}{32}\log_{0.9981999156200000}\left(\frac{28\,175.3572570000}{1724.15736550000\times 146.8103348570000\,(19.9231\times 8.95608)}\right)-\pi+\frac{1}{\phi}=\frac{1}{\phi}-\pi-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-0.999376)^k}{k}}{32\log(0.9981999156200000)}$$

$$\frac{1}{32}\log_{0.9981999156200000}\left(\frac{28\,175.3572570000}{1724.15736550000\times 146.8103348570000\,(19.9231\times 8.95608)}\right)-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi-17.344672298952\log(0.000623824)-\frac{1}{32}\log(0.000623824)\sum_{k=0}^{\infty}(-0.0018000843800000)^k\,G(k)$$
$$\text{for}\left(G(0)=0\text{ and }G(k)=\frac{(-1)^{1+k}k}{2(1+k)(2+k)}+\sum_{j=1}^{k}\frac{(-1)^{1+j}G(-j+k)}{1+j}\right)$$

Now, we have that:

$$u=\frac{3M}{4Q_*^2}\left[1-\left(1-\frac{8Q_*^2}{9M^2}\right)^{1/2}\right]=u_c\quad\text{(say).}\qquad(76)$$

The corresponding value of $r$ is

$$r_c=1.5M\left[1+\left(1-8Q_*^2/9M^2\right)^{1/2}\right].\qquad(77)$$

It is clear that at this radius $r_c$, the geodesic equations allow an unstable circular orbit.

For M = 0.13957 and Q = 0.8

1.5*0.13957(((1+(1-(8*0.8^2)/(9*0.13957^2))^1/2)))

**Input:**

$$1.5\times 0.13957\left(1+\sqrt{1-\frac{8\times 0.8^2}{9\times 0.13957^2}}\right)$$

**Result:**

0.209355... +
1.11183... $i$

**Polar coordinates:**

$r = 1.13137$ (radius), $\theta = 79.3362°$ (angle)

$1.13137 = r_c$

(3*0.13957)/(4*0.8^2)* (((1-(1-(8*0.8^2)/(9*0.13957^2))^1/2)))

**Input:**

$$\frac{3\times0.13957}{4\times0.8^2}\left(1-\sqrt{1-\frac{8\times0.8^2}{9\times0.13957^2}}\right)$$

**Result:**

0.163559... −
0.868619... $i$

**Polar coordinates:**

$r = 0.883883$ (radius), $\theta = -79.3362°$ (angle)

$0.883883 = u_c$

(((1/(0.883883/1.131370))))^2

**Input interpretation:**

$$\left(\frac{1}{\frac{0.883883}{1.131370}}\right)^2$$

**Result:**

1.638399304885448828630129014108928003974727623624703210172...

$1.638399304885448.... \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 ...$

((((0.883883/1.131370))))^1/24

**Input interpretation:**

$$\sqrt[24]{\frac{0.883883}{1.131370}}$$

**Result:**

0.9897669...

0.9897669... result practically equal to the dilaton value **0.989117352243 = $\phi$** (see Appendix)

5 log base 0.9897669 ((((0.883883/1.131370))))+Pi+golden ratio^2

**Input interpretation:**

$$5 \log_{0.9897669}\left(\frac{0.883883}{1.131370}\right) + \pi + \phi^2$$

$\log_b(x)$ is the base- $b$ logarithm

$\phi$ is the golden ratio

**Result:**

125.760...

125.760… result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18

**Alternative representation:**

$$5 \log_{0.989767}\left(\frac{0.883883}{1.13137}\right) + \pi + \phi^2 = \pi + \phi^2 + \frac{5 \log\left(\frac{0.883883}{1.13137}\right)}{\log(0.989767)}$$

**Series representations:**

$$5 \log_{0.989767}\left(\frac{0.883883}{1.13137}\right) + \pi + \phi^2 = \phi^2 + \pi - \frac{5 \sum_{k=1}^{\infty} \frac{(-1)^k (-0.21875)^k}{k}}{\log(0.989767)}$$

$$5 \log_{0.989767}\left(\frac{0.883883}{1.13137}\right) + \pi + \phi^2 =$$

$$\phi^2 + \pi - 486.11 \log(0.78125) - 5 \log(0.78125) \sum_{k=0}^{\infty} (-0.0102331)^k G(k)$$

$$\text{for } \left(G(0) = 0 \text{ and } G(k) = \frac{(-1)^{1+k} k}{2(1+k)(2+k)} + \sum_{j=1}^{k} \frac{(-1)^{1+j} G(-j+k)}{1+j}\right)$$

5 log base 0.9897669 ((((0.883883/1.131370))))+11+7+golden ratio

Where 11 and 7 are Lucas numbers

**Input interpretation:**

$$5 \log_{0.9897669}\left(\frac{0.883883}{1.131370}\right) + 11 + 7 + \phi$$

$\log_b(x)$ is the base- $b$ logarithm

$\phi$ is the golden ratio

**Result:**

139.618...

139.618… result practically equal to the rest mass of Pion meson 139.57

**Alternative representation:**

$$5 \log_{0.989767}\left(\frac{0.883883}{1.13137}\right) + 11 + 7 + \phi = 18 + \phi + \frac{5 \log\left(\frac{0.883883}{1.13137}\right)}{\log(0.989767)}$$

**Series representations:**

$$5 \log_{0.989767}\left(\frac{0.883883}{1.13137}\right) + 11 + 7 + \phi = 18 + \phi - \frac{5 \sum_{k=1}^{\infty} \frac{(-1)^k (-0.21875)^k}{k}}{\log(0.989767)}$$

$$5 \log_{0.989767}\left(\frac{0.883883}{1.13137}\right) + 11 + 7 + \phi =$$

$$18 + \phi - 486.11 \log(0.78125) - 5 \log(0.78125) \sum_{k=0}^{\infty} (-0.0102331)^k G(k)$$

$$\text{for } \left( G(0) = 0 \text{ and } G(k) = \frac{(-1)^{1+k} k}{2(1+k)(2+k)} + \sum_{j=1}^{k} \frac{(-1)^{1+j} G(-j+k)}{1+j} \right)$$

Now, we have that:

From these equations, it follows that the energy $E$ and the angular momentum $L$ of a circular orbit of radius $r_c = 1/u_c$ is given by

$$E^2 = \frac{(1 - 2Mu_c + Q_*^2 u_c^2)^2}{1 - 3Mu_c + 2Q_*^2 u_c^2} \tag{91}$$

and

$$L^2 = \frac{M - Q_*^2 u_c}{u_c(1 - 3Mu_c + 2Q_*^2 u_c^2)}. \tag{92}$$

For M = 0.13957; Q = 0.8 and $u_c$ = 0.883883, we obtain:

(1-2*0.13957*0.883883+0.8^2*0.883883^2)^2 / (1-3*0.13957*0.883883+2*0.8^2*0.883883^2)

**Input interpretation:**

$$\frac{(1 + 2 \times 0.13957 \times (-0.883883) + 0.8^2 \times 0.883883^2)^2}{1 + 3 \times 0.13957 \times (-0.883883) + 2 \times 0.8^2 \times 0.883883^2}$$

**Result:**

0.96366871505937602512123626243791144611936952381671426444 2...

0.963668715059376......= $E^2$ result very near to the spectral index $n_s$ and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}} - \varphi + 1} = 1 - \frac{e^{-\pi}}{1 + \frac{e^{-2\pi}}{1 + \frac{e^{-3\pi}}{1 + \frac{e^{-4\pi}}{1 + \dots}}}} \approx 0.9568666373$$

From:

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**Planck 2018 results. VI. Cosmological parameters**

*The primordial fluctuations are consistent with Gaussian purely adiabatic scalar perturbations characterized by a power spectrum with a spectral index* $n_s = 0.965 \pm 0.004$*, consistent with the predictions of slow-roll, single-field, inflation.*

Thence:

sqrt(((((1-2*0.13957*0.883883+0.8^2*0.883883^2)^2 / (1-3*0.13957*0.883883+2*0.8^2*0.883883^2)))))

**Input interpretation:**

$$\sqrt{\frac{(1+2\times 0.13957\times(-0.883883)+0.8^2\times 0.883883^2)^2}{1+3\times 0.13957\times(-0.883883)+2\times 0.8^2\times 0.883883^2}}$$

**Result:**

0.981666...

0.981666.... result very near to the dilaton value $\mathbf{0.989117352243 = \phi}$ (see Appendix)

**Appendix**

From:

**Rotating strings confronting PDG mesons**
*Jacob Sonnenschein and Dorin Weissman* - arXiv:1402.5603v1 [hep-ph] 23 Feb 2014

$c\bar{c}$. **The $\Psi$ trajectory:** The left side of figure (15) depicts the $\Psi$ trajectory. Here we use the states $J/\Psi(1S)(3097)1^{--}, \chi_{c1}(1P)(3510)1^{++}$, and $\Psi(3770)1^{--}$. Since no $J = 3$ state has been observed, we use three states with $J = 1$, but with increasing orbital angular momentum $(L = 0, 1, 2)$ and do the fit to $L$ instead of $J$. To give an idea of the shifts in mass involved, the $J^{PC} = 2^{++}$ state $\chi_{c2}$ has a mass of 3556 MeV, and the $J^{PC} = 3^{--}$ state is expected to lie $30 - 60$ MeV above the $\Psi(3770)$[23].

The best linear fit is

$$\alpha' = 0.418, a = -4.04$$

with $\chi_l^2 = 3.41 \times 10^{-4}$, but the optimal fit is far from the linear, with endpoint masses in the range of the constituent $c$ quark mass:

$$m_c = 1500, \alpha' = 0.979, a = -0.09$$

with $\chi_m^2 = 5 \times 10^{-7}$ $(\chi_m^2/\chi_l^2 = 0.002)$. Aside from the improvement in $\chi^2$, by adding the mass we also get a value for the slope (and to a lesser extent, the intercept) that is much closer to that obtained in fits for the light meson trajectories.

where α' is the Regge slope (string tension)

We know also that:

| | | | |
|---|---|---|---|
| $\omega$ | 6 | $m_{u/d} = 0 - 60$ | $0.910 - 0.918$ |
| $\omega/\omega_3$ | $5 + 3$ | $m_{u/d} = 255 - 390$ | $0.988 - 1.18$ |
| $\omega/\omega_3$ | $5 + 3$ | $m_{u/d} = 240 - 345$ | $0.937 - 1.000$ |

The average of the various Regge slope of Omega mesons are:

1/7 * (0.979 + 0.910 + 0.918 + 0.988 + 0.937 + 1.18 +1) = 0.987428571 result very near to the value of dilaton and to the solution 0.987516007… of the above expression.

From:

Astronomy & Astrophysics manuscript no. ms c ESO 2019 - September 24, 2019
**Planck 2018 results. VI. Cosmological parameters**

*The primordial fluctuations are consistent with Gaussian purely adiabatic scalar perturbations characterized by a power spectrum with a spectral index $n_s = 0.965 \pm 0.004$, consistent with the predictions of slow-roll, single-field, inflation.*

from:

**Modular equations and approximations to $\pi$** - *Srinivasa Ramanujan*
Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

We have that:

Hence

$$\begin{aligned} 64g_{22}^{24} &= e^{\pi\sqrt{22}} - 24 + 276e^{-\pi\sqrt{22}} - \cdots, \\ 64g_{22}^{-24} &= 4096e^{-\pi\sqrt{22}} + \cdots, \end{aligned}$$

so 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

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

Again

$$G_{37} = (6+\sqrt{37})^{\frac{1}{4}},$$

$$\begin{aligned} 64G_{37}^{24} &= e^{\pi\sqrt{37}} + 24 + 276e^{-\pi\sqrt{37}} + \cdots, \\ 64G_{37}^{-24} &= 4096e^{-\pi\sqrt{37}} - \cdots, \end{aligned}$$

so that

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

Hence

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

Similarly, from

$$g_{58} = \sqrt{\left(\frac{5+\sqrt{29}}{2}\right)},$$

we obtain

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

Hence

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

From:

**An Update on Brane Supersymmetry Breaking**
*J. Mourad and A. Sagnotti* - arXiv:1711.11494v1 [hep-th] 30 Nov 2017

From the following vacuum equations:

$$T\, e^{\gamma_E \phi} = -\frac{\beta_E^{(p)}\, h^2}{\gamma_E}\, e^{-2(8-p)C + 2\beta_E^{(p)}\phi}$$

$$16\, k'\, e^{\;\;2C} = \frac{h^2 \left(p + 1 - \frac{2\beta_E^{(p)}}{\gamma_E}\right) e^{-2(8-p)C + 2\beta_E^{(p)}\phi}}{(7 - p)}$$

$$(A')^2 - k\, e^{-2A} + \frac{h^2}{16(p+1)} \left(7 - p + \frac{2\beta_E^{(p)}}{\gamma_E}\right) e^{-2(8-p)C + 2\beta_E^{(p)}\phi}$$

we have obtained, from the results almost equals of the equations, putting

$4096\, e^{-\pi\sqrt{18}}$ instead of

$$e^{-2(8-p)C + 2\beta_E^{(p)}\phi}$$

a new possible mathematical connection between the two exponentials. Thence, also the values concerning $p$, $C$, $\beta_E$ and $\phi$ correspond to the exponents of $e$ (i.e. of exp). Thence we obtain for p = 5 and $\beta_E = 1/2$:

$$e^{-6C+\phi} = 4096 e^{-\pi\sqrt{18}}$$

Therefore, with respect to the exponentials of the vacuum equations, the Ramanujan's exponential has a coefficient of 4096 which is equal to $64^2$, while -6C+$\phi$ is equal to -$\pi\sqrt{18}$. From this it follows that it is possible to establish mathematically, the dilaton value.

For

exp((-Pi*sqrt(18)) we obtain:

**Input:**

$\exp\left(-\pi\sqrt{18}\right)$

**Exact result:**

$e^{-3\sqrt{2}\,\pi}$

**Decimal approximation:**

$1.6272016226072509292942156739117979541838581136954016... \times 10^{-6}$

1.6272016… * $10^{-6}$

**Property:**

$e^{-3\sqrt{2}\pi}$ is a transcendental number

**Series representations:**

$$e^{-\pi\sqrt{18}} = e^{-\pi\sqrt{17}\sum_{k=0}^{\infty} 17^{-k}\binom{1/2}{k}}$$

$$e^{-\pi\sqrt{18}} = \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{17}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e^{-\pi\sqrt{18}} = \exp\left(-\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 17^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)$$

Now, we have the following calculations:

$$e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$$

$$e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

from which:

$$\frac{1}{4096}e^{-6C+\phi} = 1.6272016\ldots * 10^{-6}$$

$$0.000244140625\, e^{-6C+\phi} = e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

Now:

$$\ln\left(e^{-\pi\sqrt{18}}\right) = -13.328648814475 = -\pi\sqrt{18}$$

And:

(1.6272016* 10^-6) *1/ (0.000244140625)

**Input interpretation:**

$$\frac{1.6272016}{10^6} \times \frac{1}{0.000244140625}$$

**Result:**

0.0066650177536

0.006665017...

Thence:

$$0.000244140625\ e^{-6C+\phi} = e^{-\pi\sqrt{18}}$$

Dividing both sides by 0.000244140625, we obtain:

$$\frac{0.000244140625}{0.000244140625} e^{-6C+\phi} = \frac{1}{0.000244140625} e^{-\pi\sqrt{18}}$$

$$e^{-6C+\phi} = 0.0066650177536$$

((((exp((-Pi*sqrt(18)))))))*1/0.000244140625

**Input interpretation:**

$$\exp\left(-\pi\sqrt{18}\right) \times \frac{1}{0.000244140625}$$

**Result:**

0.00666501785...

0.00666501785…

**Series representations:**

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty} 17^{-k}\binom{\frac{1}{2}}{k}\right)$$

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{17}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\frac{\pi \sum_{j=0}^{\infty} \text{Res}_{s=-\frac{1}{2}+j} 17^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)$$

Now:

$$e^{-6C+\phi} = 0.0066650177536$$

$$\exp\left(-\pi\sqrt{18}\right)\times\frac{1}{0.000244140625} =$$

$$e^{-\pi\sqrt{18}}\times\frac{1}{0.000244140625}$$

$$= 0.00666501785\ldots$$

From:

ln(0.00666501784619)

**Input interpretation:**

log(0.00666501784619)

**Result:**

-5.010882647757...

-5.010882647757…

**Alternative representations:**

$$\log(0.006665017846190000) = \log_e(0.006665017846190000)$$

$$\log(0.006665017846190000) = \log(a)\log_a(0.006665017846190000)$$

$$\log(0.006665017846190000) = -\text{Li}_1(0.993334982153810000)$$

**Series representations:**

$$\log(0.006665017846190000) = -\sum_{k=1}^{\infty} \frac{(-1)^k (-0.993334982153810000)^k}{k}$$

$$\log(0.006665017846190000) = 2 i \pi \left\lfloor \frac{\arg(0.006665017846190000 - x)}{2\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.006665017846190000 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

$$\log(0.006665017846190000) = \left\lfloor \frac{\arg(0.006665017846190000 - z_0)}{2\pi} \right\rfloor \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left\lfloor \frac{\arg(0.006665017846190000 - z_0)}{2\pi} \right\rfloor \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.006665017846190000 - z_0)^k z_0^{-k}}{k}$$

**Integral representation:**

$$\log(0.006665017846190000) = \int_1^{0.006665017846190000} \frac{1}{t}\, dt$$

In conclusion:

$$-6C + \phi = -5.010882647757 \ldots$$

and for C = 1, we obtain:

$\phi = -5.010882647757 + 6 = \mathbf{0.989117352243} = \boldsymbol{\phi}$

Note that the values of $n_s$ (spectral index) 0.965, of the average of the Omega mesons Regge slope 0.987428571 and of the dilaton 0.989117352243, are also connected to the following two Rogers-Ramanujan continued fractions:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}}-\varphi+1} = 1-\cfrac{e^{-\pi}}{1+\cfrac{e^{-2\pi}}{1+\cfrac{e^{-3\pi}}{1+\cfrac{e^{-4\pi}}{1+\ldots}}}} \approx 0.9568666373$$

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1} = 1-\cfrac{e^{-\pi\sqrt{5}}}{1+\cfrac{e^{-2\pi\sqrt{5}}}{1+\cfrac{e^{-3\pi\sqrt{5}}}{1+\cfrac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}} \approx 0.9991104684$$

(http://www.bitman.name/math/article/102/109/)

Also performing the 512$^{th}$ root of the inverse value of the Pion meson rest mass 139.57, we obtain:

((1/(139.57)))^1/512

**Input interpretation:**

$$\sqrt[512]{\frac{1}{139.57}}$$

**Result:**

0.990400732708644027550973755713301415460732796178555551684...

0.99040073.... result very near to the dilaton value **0.989117352243** = $\phi$ and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\dots}}}}\approx 0.9991104684$$

From:

Eur. Phys. J. C (2019) 79:713 - https://doi.org/10.1140/epjc/s10052-019-7225-2-Regular Article - Theoretical Physics

**Generalized dilaton–axion models of inflation, de Sitter vacua and spontaneous SUSY breaking in supergravity**

*Yermek Aldabergenov, Auttakit Chatrabhuti, Sergei V. Ketov*

**Table 1** The predictions for the inflationary parameters ($n_s, r$), and the values of $\varphi$ at the horizon crossing ($\varphi_i$) and at the end of inflation ($\varphi_f$), in the case $3 \le \alpha \le \alpha_*$ with both signs of $\omega_1$. The $\alpha$ parameter is taken to be integer, except of the upper limit $\alpha_* \equiv (7+\sqrt{33})/2$

| $\alpha$ | 3 | 4 | | 5 | 6 | | $\alpha_*$ |
|---|---|---|---|---|---|---|---|
| sgn($\omega_1$) | − | + | − | +/− | + | − | − |
| $n_s$ | 0.9650 | 0.9649 | 0.9640 | 0.9639 | 0.9634 | 0.9637 | 0.9632 |
| $r$ | 0.0035 | 0.0010 | 0.0013 | 0.0007 | 0.0005 | 0.0004 | 0.0003 |
| $-\kappa\varphi_i$ | 5.3529 | 3.5542 | 3.9899 | 3.2657 | 3.0215 | 2.7427 | 2.5674 |
| $-\kappa\varphi_f$ | 0.9402 | 0.7426 | 0.8067 | 0.7163 | 0.6935 | 0.6488 | 0.6276 |

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**Gravitational waves from walking technicolor**

*Kohtaroh Miura, Hiroshi Ohki, Saeko Otani and Koichi Yamawaki*

The phase transition dynamics is modified via the shift of $(2f_2/N_f)(s^0)^2 \to (\Delta m_s)^2 + (2f_2/N_f)(s^0)^2$ in $m_{s^i}^2$ with finite $\Delta m_s$. The details of the mass spectra at one loop with $(\Delta m_s)^2$ are summarized in appendix A. Using eq. (4.18), the total effective potential becomes,

$$V_{\rm eff}(s^0,\Delta m_p,\Delta m_s,T) = \frac{N_f^2-1}{64\pi^2}\mathcal{M}_{s^i}^4(s^0,\Delta m_p,\Delta m_s,T)\left(\ln\frac{\mathcal{M}_{s^i}^2(s^0,\Delta m_p,\Delta m_s,T)}{\mu_{\rm GW}^2}-\frac{3}{2}\right), \\ +\frac{T^4}{2\pi^2}(N_f^2-1)J_B\left(\mathcal{M}_{s^i}^2(s^0,\Delta m_p,\Delta m_s,T)/T^2\right)+C(T), \qquad (4.19)$$

with,

$$\mathcal{M}_{s^i}^2(s^0,\Delta m_p,\Delta m_s,T) = m_{s^i}^2(s^0,\Delta m_p,\Delta m_s) + \Pi(T)\,, \qquad (4.20)$$

where the thermal mass $\Pi(T)$ is given in eq. (3.3). We require that the following properties remain intact for arbitrary $\Delta m_s$; (1) the vev $\langle s^0\rangle(T=0)$ determined by the minimum of the potential eq. (4.19) is identified with the dilaton decay constant favored by the walking technicolor model, $F_\phi = 1.25\,\text{TeV}$ or $1\,\text{TeV}$, (2) the dilaton mass given by the potential curvature at the vacuum is identified with the observed SM Higgs mass, $m_{s^0} = 125\,\text{GeV}$.

Thence $F_\phi = 1.25$ TeV

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