On the theoretical framework concerning the motivations of the mathematical connections between various formulas of Ramanujan's mathematics and different parameters of Theoretical Physics and Cosmology: further observations. II

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Abstract

In this paper, we have analyzed a fundamental modular equation for an initial theoretical framework concerning the motivations of the mathematical connections that are obtained between various formulas of Ramanujan's mathematics and different parameters of Theoretical Physics and Cosmology: further observations.

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https://www.britannica.com/biography/Srinivasa-Ramanujan

Introduction

"In the work of Ramanujan, the number 24 appears repeatedly. This is an example of what mathematicians call magic numbers, which continually appear, where we least expect them, for reasons that no one understands. Miraculously, Ramanujan's function also appears in string theory. The number 24 appearing in Ramanujan's function is also the origin of the miraculous cancellations occurring in string theory. In string theory, each of the 24 modes in the Ramanujan function corresponds to a physical vibration of the string. Whenever the string executes its complex motions in space-time by splitting and recombining, a large number of highly sophisticated mathematical identities must be satisfied. These are precisely the mathematical identities discovered by Ramanujan. (Since physicists add two more dimensions when they count the total number of vibrations appearing in a relativistic theory, this means that space-time must have 24 + 2 = 26 space-time dimensions.)"

"When the Ramanujan function is generalized, the number 24 is replaced by the number 8. Thus the critical number for the superstring is 8 + 2, or 10. This is the origin of the tenth dimension. The string vibrates in ten dimensions because it requires these generalized Ramanujan functions in order to remain self-consistent. In other words, physicists have not the slightest understanding of why ten and 26 dimensions are singled out as the dimension of the string. It's as though there is some kind of deep numerology being manifested in these functions that no one understands. It is precisely these magic numbers appearing in the elliptic modular function that determines the dimension of space-time to be ten."

(Michio Kaku, Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the Tenth Dimension)

Now, from

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

we analyze the following formula:

$$G_{65} = \left\{\left(\frac{1+\sqrt{5}}{2}\right)\left(\frac{3+\sqrt{13}}{2}\right)\right\}^{\frac{1}{4}} \sqrt{\left\{\sqrt{\left(\frac{9+\sqrt{65}}{8}\right)}+\sqrt{\left(\frac{1+\sqrt{65}}{8}\right)}\right\}}.$$

[((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/8)+sqrt((1+65^0.5)/8))))^1/2

Input:

$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}$$

Exact result:

$$\frac{\sqrt[4]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}}}{\sqrt{2}}$$

Decimal approximation:

2.415871946186809362816339075281469555671777147068661130889...

2.41587194618…

Alternate forms:

$$\frac{1}{2}\sqrt[4]{\frac{1}{2}\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}$$

$$\frac{\sqrt[4]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}}}{2\sqrt{2}}$$

$$\sqrt{\text{root of } x^8-8x^7+12x^6+8x^5-27x^4+8x^3+12x^2-8x+1 \text{ near } x=5.83644}$$

Minimal polynomial:

$$x^{16} - 8x^{14} + 12x^{12} + 8x^{10} - 27x^8 + 8x^6 + 12x^4 - 8x^2 + 1$$

From which we calculate, squaring the two terms (1+√5)/2 and (3+√13)/2 and putting 1/24 instead of 8 that multiplied the two terms 9+√65 and 1+√65, we obtain:

[((1+sqrt5)/2)^2 ((3+sqrt13)/2)^2]^1/4 (((sqrt((9+65^0.5)/24)+sqrt((1+65^0.5)/24))))^1/2

Input:

$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)^2\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)^2}\sqrt{\sqrt{\frac{1}{24}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{24}\left(1+\sqrt{65}\right)}}$$

Exact result:

$$\frac{1}{2}\sqrt{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\left(\frac{1}{2}\sqrt{\frac{1}{6}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{6}\left(9+\sqrt{65}\right)}\right)}$$

Decimal approximation:

2.791002819266536925164482620044353502833296791440335845365...

2.791002819266…

Alternate forms:

$$\frac{1}{4}\sqrt{\left(\sqrt{\frac{1}{3}-\frac{8i}{3}}+\sqrt{\frac{1}{3}+\frac{8i}{3}}+\sqrt{\frac{5}{3}}+\sqrt{\frac{13}{3}}\right)\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}$$

$$\frac{\sqrt{(1+\sqrt{5})(3+\sqrt{13})\left(\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}\right)}}{2\times 2^{3/4}\sqrt[4]{3}}$$

$$\sqrt[4]{\text{root of } 6561x^8 - 393660x^7 - 278478x^6 + 466560x^5 + 1169883x^4 + 51840x^3 - 3438x^2 - 540x + 1 \text{ near } x = 60.6794}$$

Minimal polynomial:

$$6561x^{32} - 393660x^{28} - 278478x^{24} + 466560x^{20} + 1169883x^{16} + 51840x^{12} - 3438x^8 - 540x^4 + 1$$

Now, performing the square root of the previous expression, we obtain:

From

[((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/8)+sqrt((1+65^0.5)/8))))^1/2

multiplying by 1/3, the following terms within the roots, (1+√5)/2, (3+√13)/2, 9+√65 and 1+√65, we obtain:

[(1/3(((1+sqrt5)/2) ((3+sqrt13)/2)))]^1/4
(((sqrt(1/3(9+65^0.5)/8)+sqrt(1/3(1+65^0.5)/8))))^1/2

Input:

$$\sqrt[4]{\frac{1}{3}\left(\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)\right)}\sqrt{\sqrt{\frac{1}{3}\left(\frac{1}{8}\left(9+\sqrt{65}\right)\right)}+\sqrt{\frac{1}{3}\left(\frac{1}{8}\left(1+\sqrt{65}\right)\right)}}$$

Exact result:

$$\frac{\sqrt[4]{\frac{1}{3}\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\sqrt{\frac{1}{2}\sqrt{\frac{1}{6}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{6}\left(9+\sqrt{65}\right)}}}{\sqrt{2}}$$

Decimal approximation:

1.394804318458619474625610830105273761964580280875442373809...

1.394804318458…

Alternate forms:

$$\frac{\sqrt[4]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\left(5+\sqrt{65}+\sqrt{74+10\sqrt{65}}\right)}}{2\sqrt{3}}$$

$$\frac{\sqrt[4]{\frac{1}{2}\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}}{2\sqrt{3}}$$

$$\frac{\sqrt{\sqrt{\frac{1}{3}-\frac{8i}{3}}+\sqrt{\frac{1}{3}+\frac{8i}{3}}+\sqrt{\frac{5}{3}}+\sqrt{\frac{13}{3}}}\sqrt[4]{\frac{1}{3}\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}}{2\sqrt{2}}$$

Minimal polynomial:

$$6561 x^{16} - 17496 x^{14} + 8748 x^{12} + 1944 x^{10} - 2187 x^8 + 216 x^6 + 108 x^4 - 24 x^2 + 1$$

Or, equivalently:

[(1/3(((1+sqrt5)/2) ((3+sqrt13)/2)))]^1/4 (((sqrt(1/24(9+65^0.5))+sqrt(1/24(1+65^0.5)))))^1/2

Input:

$$\sqrt[4]{\frac{1}{3}\left(\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)\right)}\sqrt{\sqrt{\frac{1}{24}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{24}\left(1+\sqrt{65}\right)}}$$

Exact result:

$$\frac{\sqrt[4]{\frac{1}{3}(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\frac{1}{2}\sqrt{\frac{1}{6}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{6}\left(9+\sqrt{65}\right)}}}{\sqrt{2}}$$

Decimal approximation:

1.394804318458619474625610830105273761964580280875442373809...

1.39480431845…

Alternate forms:

$$\frac{\sqrt[4]{(1+\sqrt{5})(3+\sqrt{13})\left(5+\sqrt{65}+\sqrt{74+10\sqrt{65}}\right)}}{2\sqrt{3}}$$

$$\frac{\sqrt[4]{\frac{1}{2}(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}}{2\sqrt{3}}$$

$$\frac{\sqrt{\sqrt{\frac{1}{3}-\frac{8i}{3}}+\sqrt{\frac{1}{3}+\frac{8i}{3}}+\sqrt{\frac{5}{3}}+\sqrt{\frac{13}{3}}}\sqrt[4]{\frac{1}{3}(1+\sqrt{5})(3+\sqrt{13})}}{2\sqrt{2}}$$

Minimal polynomial:

$$6561 x^{16} - 17496 x^{14} + 8748 x^{12} + 1944 x^{10} - 2187 x^8 + 216 x^6 + 108 x^4 - 24 x^2 + 1$$

Note that:

1/10^27*sqrt((((((([((1+sqrt5)/2)^2 ((3+sqrt13)/2)^2]^1/4 (((sqrt((9+65^0.5)/24)+sqrt((1+65^0.5)/24))))^1/2))))))

Input:

$$\frac{1}{10^{27}}\sqrt{\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)^2\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)^2}\sqrt{\sqrt{\frac{1}{24}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{24}\left(1+\sqrt{65}\right)}}}$$

Exact result:

$$\frac{\sqrt[4]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\left(\frac{1}{2}\sqrt{\frac{1}{6}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{6}\left(9+\sqrt{65}\right)}\right)}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000\sqrt{2}}$$

Decimal approximation:

$1.670629467975031537383326940070146452943581917796807 4\ldots \times 10^{-27}$

$1.6706294679\ldots*10^{-27}$ result very near to the value of the formula:

$$m_{p'} = 2\times\frac{\eta}{R}m_P = 1.6714213\times10^{-27}\text{ kg}$$

that is the holographic proton mass (N. Haramein) that we have obtained performing the square root of the expression and multiplying by 10^{-27} (this result is a sub-multiple of a "golden number" 1.6706294679...)

Alternate forms:

$$\frac{\sqrt[4]{\left(\sqrt{\frac{1}{3}-\frac{8i}{3}}+\sqrt{\frac{1}{3}+\frac{8i}{3}}+\sqrt{\frac{5}{3}}+\sqrt{\frac{13}{3}}\right)\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}}{2\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{\sqrt[4]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\left(\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}\right)}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000\times 2^{7/8}\sqrt[8]{3}}$$

Furthermore, we obtain:

a) [(1/3(((1+sqrt5)/2) ((3+sqrt13)/2)))]^1/4 (((sqrt(1/x(9+65^0.5))+sqrt(1/x(1+65^0.5)))))^1/2 =1.39480431845

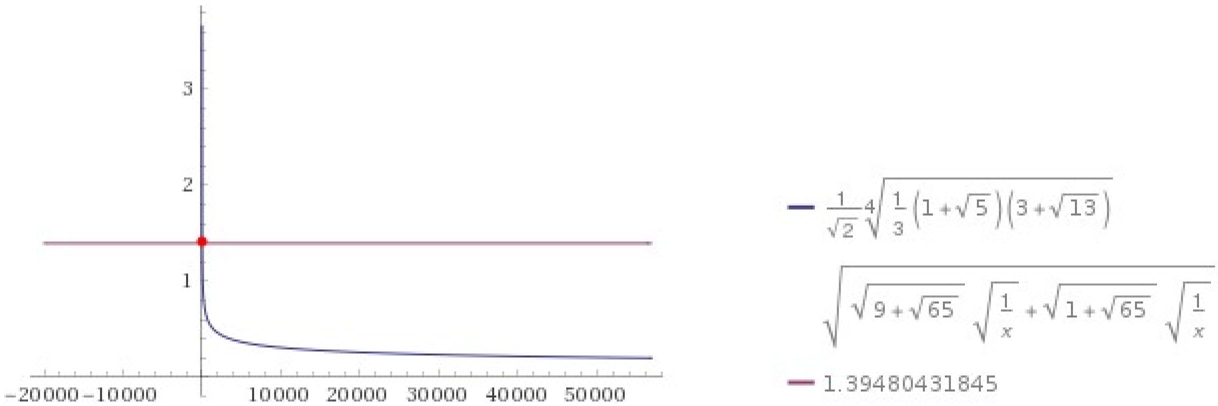
Input interpretation:

$$\sqrt[4]{\frac{1}{3}\left(\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)\right)}\sqrt{\sqrt{\frac{1}{x}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{x}\left(1+\sqrt{65}\right)}} = 1.39480431845$$

Result:

$$\frac{\sqrt[4]{\frac{1}{3}(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\sqrt{9+\sqrt{65}}\sqrt{\frac{1}{x}}+\sqrt{1+\sqrt{65}}\sqrt{\frac{1}{x}}}}{\sqrt{2}} = 1.39480431845$$

Plot:



Solution:

$x = 24.0000000006$

24

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

And

b) [(1/3(((x)) ((3+sqrt13)/2)))]^1/4 (((sqrt(1/24(9+65^0.5))+sqrt(1/24(1+65^0.5)))))^1/2 =1.39480431845

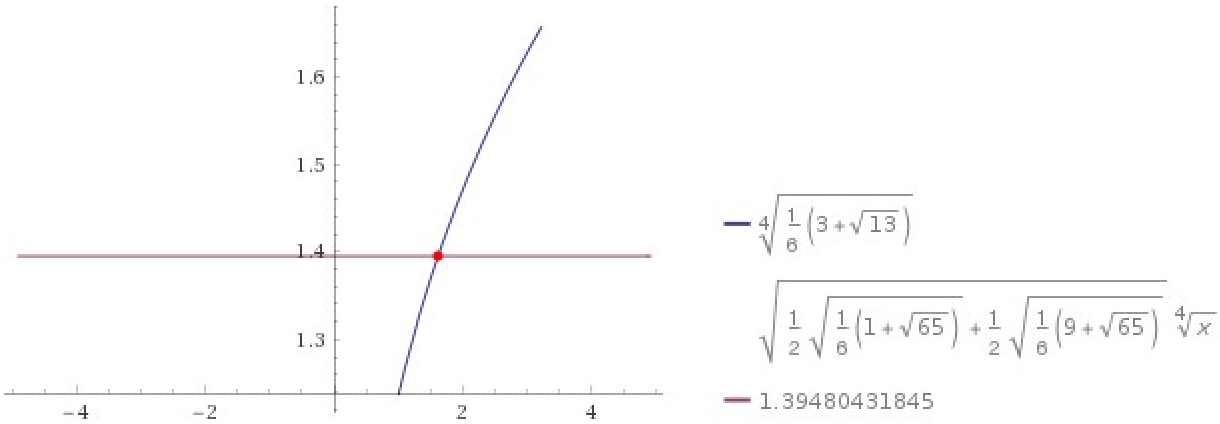
Input interpretation:

$$\sqrt[4]{\frac{1}{3}\left(x\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)\right)}\sqrt{\sqrt{\frac{1}{24}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{24}\left(1+\sqrt{65}\right)}} = 1.39480431845$$

Result:

$$\sqrt[4]{\frac{1}{6}\left(3+\sqrt{13}\right)}\sqrt{\frac{1}{2}\sqrt{\frac{1}{6}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{6}\left(9+\sqrt{65}\right)}}\sqrt[4]{x} = 1.39480431845$$

Plot:



Alternate forms:

$$\frac{\sqrt[4]{\left(3+\sqrt{13}\right)\left(5+\sqrt{65}+\sqrt{74+10\sqrt{65}}\right)}\sqrt[4]{x}}{2^{3/4}\sqrt{3}} = 1.39480431845$$

$$\frac{\sqrt[4]{3+\sqrt{13}}\ \sqrt{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}\ \sqrt[4]{x}}{2\sqrt{3}} = 1.39480431845$$

$$\sqrt[4]{x}\ \sqrt[4]{\text{root of } 43046721x^8 - 71744535x^7 - 60052833x^6 - 17714700x^5 - 603612x^4 + 218700x^3 - 9153x^2 + 135x + 1 \text{ near } x = 2.33919} = 1.39480431845$$

Alternate form assuming x is positive:

$1.00000000000\sqrt[4]{x} = 1.12783848555$

Solution:

$x = 1.61803398871$

1.61803398871 result that is the value of the golden ratio

From the following Ramanujan expression:

$$64a - 4096be^{-\pi\sqrt{n}} + \cdots = e^{\pi\sqrt{n}} - 24 + 276e^{-\pi\sqrt{n}} - \cdots,$$

for n = 65, calculating the right hand side, we obtain:

e^(Pi*sqrt65)-24+276*e^(-Pi*sqrt65)

Input:

$e^{\pi\sqrt{65}} - 24 + 276\,e^{-\pi\sqrt{65}}$

Exact result:

$-24 + 276\,e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}$

Decimal approximation:

$9.998936958782675181210795051435844795060562663559055 6\ldots \times 10^{10}$

$9.998936958\ldots*10^{10}$

Property:

$-24 + 276\,e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}$ is a transcendental number

Alternate form:

$$e^{-\sqrt{65}\,\pi}\left(276-24\,e^{\sqrt{65}\,\pi}+e^{2\sqrt{65}\,\pi}\right)$$

Series representations:

$$e^{\pi\sqrt{65}}-24+276\,e^{-\pi\sqrt{65}}=e^{-\pi\sqrt{64}\sum_{k=0}^{\infty}64^{-k}\binom{1/2}{k}}\left(276-24\,e^{\pi\sqrt{64}\sum_{k=0}^{\infty}64^{-k}\binom{1/2}{k}}+e^{2\pi\sqrt{64}\sum_{k=0}^{\infty}64^{-k}\binom{1/2}{k}}\right)$$

$$e^{\pi\sqrt{65}}-24+276\,e^{-\pi\sqrt{65}}=\exp\left(-\pi\sqrt{64}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\left(276-24\,e^{\pi\sqrt{64}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}+\exp\left(2\pi\sqrt{64}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)$$

$$e^{\pi\sqrt{65}}-24+276\,e^{-\pi\sqrt{65}}=\exp\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(65-z_0)^k z_0^{-k}}{k!}\right)\left(276-24\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(65-z_0)^k z_0^{-k}}{k!}\right)+\exp\left(2\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(65-z_0)^k z_0^{-k}}{k!}\right)\right)$$

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

From this result, performing the ln, we obtain:

ln(((e^(Pi*sqrt65)-24+276*e^(-Pi*sqrt65))))

Input:

$$\log\left(e^{\pi\sqrt{65}}-24+276\,e^{-\pi\sqrt{65}}\right)$$

log(x) is the natural logarithm

Exact result:

$$\log\left(-24+276\,e^{-\sqrt{65}\,\pi}+e^{\sqrt{65}\,\pi}\right)$$

Decimal approximation:

25.32832971316208642947496892264724286761544060030537205722...

25.328329713...

Alternate form:

$$\log\left(276 - 24 e^{\sqrt{65}\,\pi} + e^{2\sqrt{65}\,\pi}\right) - \sqrt{65}\,\pi$$

Alternative representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}\right) = \log_e\left(-24 + 276 e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right)$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}\right) = \log(a)\log_a\left(-24 + 276 e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right)$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}\right) = -\text{Li}_1\left(25 - 276 e^{-\pi\sqrt{65}} - e^{\pi\sqrt{65}}\right)$$

Series representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}\right) = \log\left(-25 + 276 e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}\right) - \sum_{k=1}^{\infty} \frac{\left(-\frac{1}{-25+276 e^{-\sqrt{65}\,\pi}+e^{\sqrt{65}\,\pi}}\right)^k}{k}$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}\right) = 2 i \pi \left\lfloor \frac{\arg\left(-24 + 276 e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi} - x\right)}{2\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k \left(-24 + 276 e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi} - x\right)^k x^{-k}}{k} \quad \text{for } x < 0$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}\right) = 2 i \pi \left\lfloor \frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\pi} \right\rfloor + \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k \left(-24 + 276 e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi} - z_0\right)^k z_0^{-k}}{k}$$

Integral representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) = \int_1^{-24+276\,e^{-\sqrt{65}\,\pi}+e^{\sqrt{65}\,\pi}} \frac{1}{t}\,dt$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) = -\frac{i}{2\pi}\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{\left(-25 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}\right)^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds \quad \text{for } -1 < \gamma < 0$$

From the result obtained, we subtract the value of the above expression:

$$\sqrt[4]{\frac{1}{3}\left(\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)\right)}\,\sqrt{\sqrt{\frac{1}{24}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{24}\left(1+\sqrt{65}\right)}}$$

that is equal to 1.394804318 and obtain:

ln(((e^(Pi*sqrt65)-24+276*e^(-Pi*sqrt65))))-1.394804318

Input interpretation:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.394804318$$

log(x) is the natural logarithm

Result:

23.933525395…

23.933525395… result very near to the black hole entropy 23.9078

(From: **Three-dimensional AdS gravity and extremal CFTs at c = 8m -** https://arxiv.org/abs/0708.3386)

Alternative representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \log_e\left(-24 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right)$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \log(a)\log_a\left(-24 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right)$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 - \text{Li}_1\left(25 - 276\, e^{-\pi\sqrt{65}} - e^{\pi\sqrt{65}}\right)$$

Series representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \log\left(-25 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right) - \sum_{k=1}^{\infty} \frac{(-1)^k \left(-25 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right)^{-k}}{k}$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \log\left(-24 + 276\, e^{-\pi\sqrt{64}\sum_{k=0}^{\infty} 64^{-k}\binom{1/2}{k}} + e^{\pi\sqrt{64}\sum_{k=0}^{\infty} 64^{-k}\binom{1/2}{k}}\right)$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \log\left(-24 + 276 \exp\left(-\pi\sqrt{64}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{64}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right) + e^{\pi\sqrt{64}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{64}\right)^k \left(-\frac{1}{2}\right)_k}{k!}}\right)$$

Integral representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \int_1^{-24+276 e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}} \frac{1}{t}\, dt$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - 1.3948 = -1.3948 + \frac{1}{2 i \pi}\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{\left(-25 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right)^{-s} \Gamma(-s)^2\, \Gamma(1+s)}{\Gamma(1-s)}\, ds \quad \text{for } -1 < \gamma < 0$$

Or, subtracting $\pi^{1/4}$:

ln(((e^(Pi*sqrt65)-24+276*e^(-Pi*sqrt65))))-(Pi)^1/4

Input:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi}$$

$\log(x)$ is the natural logarithm

Exact result:

$$\log\left(-24 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}\right) - \sqrt[4]{\pi}$$

Decimal approximation:

23.996994349361696716677434004696962014306074376487267798 76...

23.99699434... ≈ 24

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

Alternate form:

$$-\sqrt[4]{\pi} - \sqrt{65}\,\pi + \log\left(276 - 24\, e^{\sqrt{65}\,\pi} + e^{2\sqrt{65}\,\pi}\right)$$

Alternative representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} = \log_e\left(-24 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right) - \sqrt[4]{\pi}$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} = \log(a)\log_a\left(-24 + 276\, e^{-\pi\sqrt{65}} + e^{\pi\sqrt{65}}\right) - \sqrt[4]{\pi}$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} = -\mathrm{Li}_1\left(25 - 276\, e^{-\pi\sqrt{65}} - e^{\pi\sqrt{65}}\right) - \sqrt[4]{\pi}$$

Series representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} =$$
$$-\sqrt[4]{\pi} + \log\left(-25 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}\right) - \sum_{k=1}^{\infty} \frac{\left(-\frac{1}{-25+276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}}\right)^k}{k}$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} =$$
$$-\sqrt[4]{\pi} + 2\, i\, \pi \left\lfloor \frac{\arg\left(-24 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi} - x\right)}{2\,\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k \left(-24 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi} - x\right)^k x^{-k}}{k} \quad \text{for } x < 0$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} = -\sqrt[4]{\pi} + 2\, i\, \pi \left\lfloor \frac{\pi - \arg\left(\frac{1}{z_0}\right) - \arg(z_0)}{2\,\pi} \right\rfloor + \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k \left(-24 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi} - z_0\right)^k z_0^{-k}}{k}$$

Integral representations:

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} = -\sqrt[4]{\pi} + \int_1^{-24+276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}} \frac{1}{t}\, dt$$

$$\log\left(e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}\right) - \sqrt[4]{\pi} =$$
$$-\sqrt[4]{\pi} - \frac{i}{2\,\pi} \int_{-i\,\infty+\gamma}^{i\,\infty+\gamma} \frac{\left(-25 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}\right)^{-s} \Gamma(-s)^2\, \Gamma(1+s)}{\Gamma(1-s)}\, ds \quad \text{for } -1 < \gamma < 0$$

From the previous expression, we obtain:

a) ln(((x^(Pi*sqrt65)-24+276*x^(-Pi*sqrt65)))) = 25.328329713162

Input interpretation:

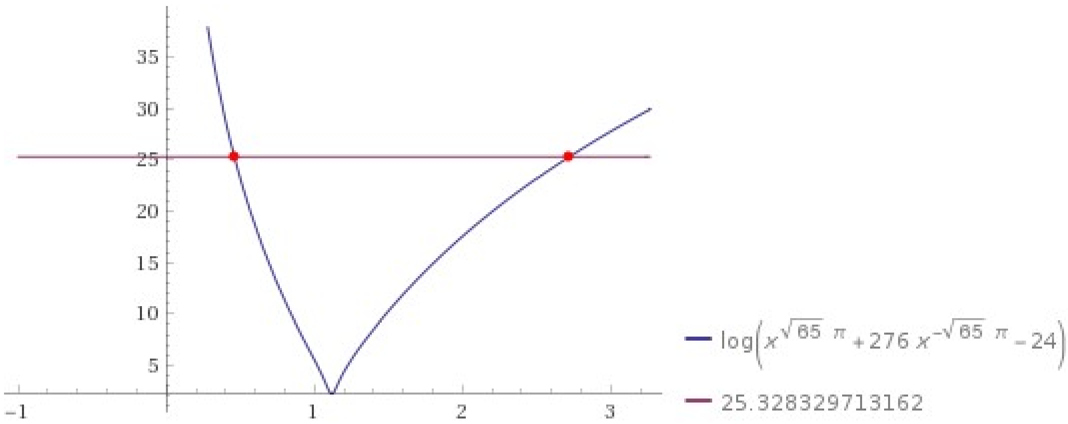
$$\log\left(x^{\pi\sqrt{65}} - 24 + 276\, x^{-\pi\sqrt{65}}\right) = 25.328329713162$$

$\log(x)$ is the natural logarithm

Result:

$$\log\left(x^{\sqrt{65}\,\pi} + 276\, x^{-\sqrt{65}\,\pi} - 24\right) = 25.328329713162$$

Plot:



Real solutions:

$x \approx 0.4592786176336052$

$x \approx 2.718281828459017$

2.718281828459017 = ***e***

Solutions:

$x \approx 2.718281828459045^{0.03948148224992763\,(6.283185307179586\, i\, n - 19.70792884768469)}$,
$-12.000000000000000 \leq n \leq 12.000000000000000$

$x \approx 2.718281828459045^{0.03948148224992763\,(6.283185307179586\, i\, n + 25.32832971340184)}$,
$-12.000000000000000 \leq n \leq 12.000000000000000$

And:

b) ln(((e^(x*sqrt65)-24+276*e^(-x*sqrt65)))) = 25.328329713162

Input interpretation:

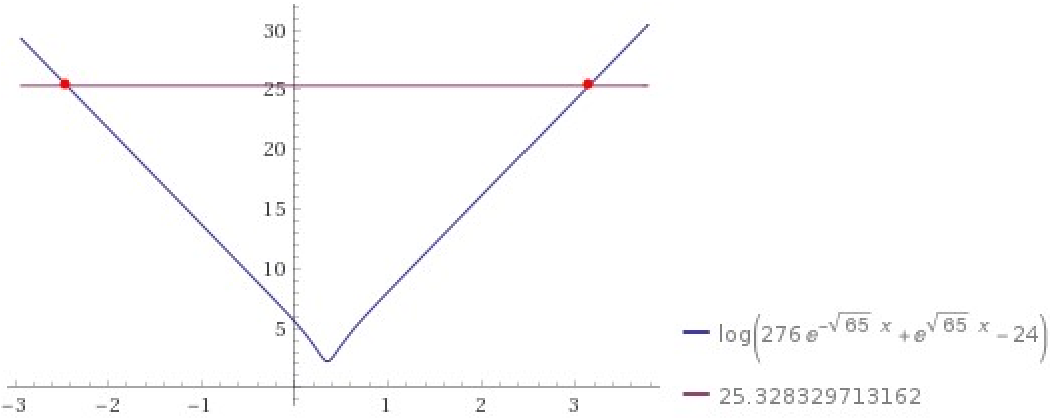
$\log\left(e^{x\sqrt{65}} - 24 + 276\, e^{-x\sqrt{65}}\right) = 25.328329713162$

log(x) is the natural logarithm

Result:

$\log\left(276\, e^{-\sqrt{65}\, x} + e^{\sqrt{65}\, x} - 24\right) = 25.328329713162$

Plot:



Real solutions:

$x \approx -2.444467723925576$

$x \approx 3.141592653589760$

3.141592653589760 = **π**

Solutions:

$x \approx 0.12403473458920846\,(6.283185307179586\,i\,n - 19.70792884768469)\,,\quad n \in \mathbb{Z}$

$x \approx 0.12403473458920846\,(6.283185307179586\,i\,n + 25.32832971340184)\,,\quad n \in \mathbb{Z}$

$\mathbb{Z}$ is the set of integers

c) ln(((e^(Pi*sqrt65)-3x+276*e^(-Pi*sqrt65)))) = 25.328329713162

Input interpretation:

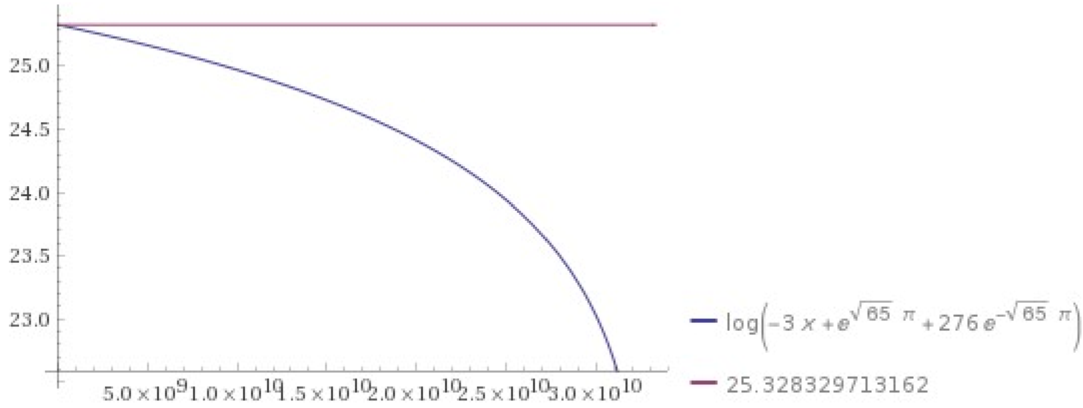
$\log\left(e^{\pi\sqrt{65}} - 3x + 276\,e^{-\pi\sqrt{65}}\right) = 25.328329713162$

log(x) is the natural logarithm

Result:

$\log\left(-3x + e^{\sqrt{65}\,\pi} + 276\,e^{-\sqrt{65}\,\pi}\right) = 25.328329713162$

Plot:



Alternate form assuming x is positive:

$\log\left(-3\, e^{\sqrt{65}\, \pi}\, x + e^{2\sqrt{65}\, \pi} + 276\right) = 50.656659426564$

Solution:

$x = 8$

8

Note that when the Ramanujan function is generalized, 24 is replaced by 8 (8 + 2 = 10) for fermionic strings

Integer solution:

$x = 0$

From the first expression

$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\ \sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}$$

we obtain:

[((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/x)+sqrt((1+65^0.5)/x))))^1/2 = 2.4158719461868

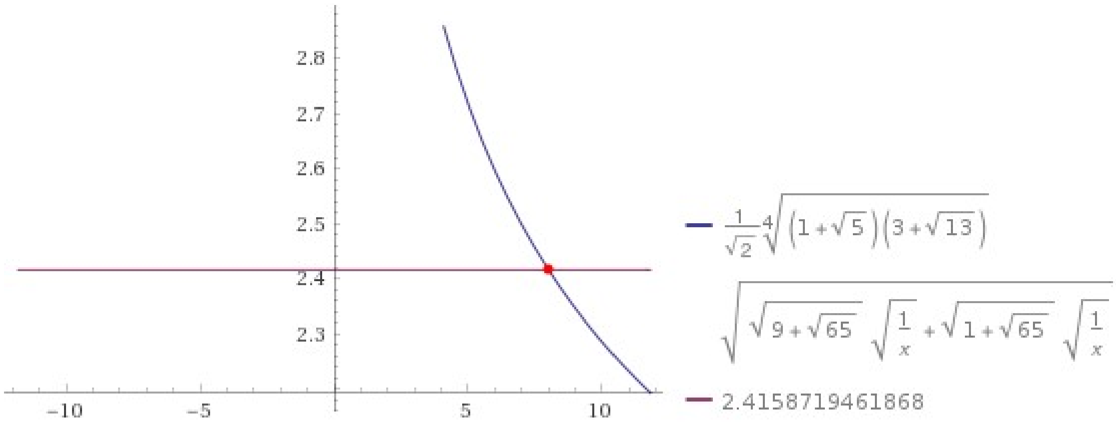
Input interpretation:

$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{9+\sqrt{65}}{x}}+\sqrt{\frac{1+\sqrt{65}}{x}}} = 2.4158719461868$$

Result:

$$\frac{\sqrt[4]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\sqrt{9+\sqrt{65}}\sqrt{\frac{1}{x}}+\sqrt{1+\sqrt{65}}\sqrt{\frac{1}{x}}}}{\sqrt{2}} = 2.4158719461868$$

Plot:



Solution:

$x = 8$

Integer solution:

$x = 8$

8

Note that when the Ramanujan function is generalized, 24 is replaced by 8 (8 + 2 = 10) for fermionic strings and:

[((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/(x-2))+sqrt((1+65^0.5)/(x-2)))))^1/2 = 2.4158719461868

Input interpretation:

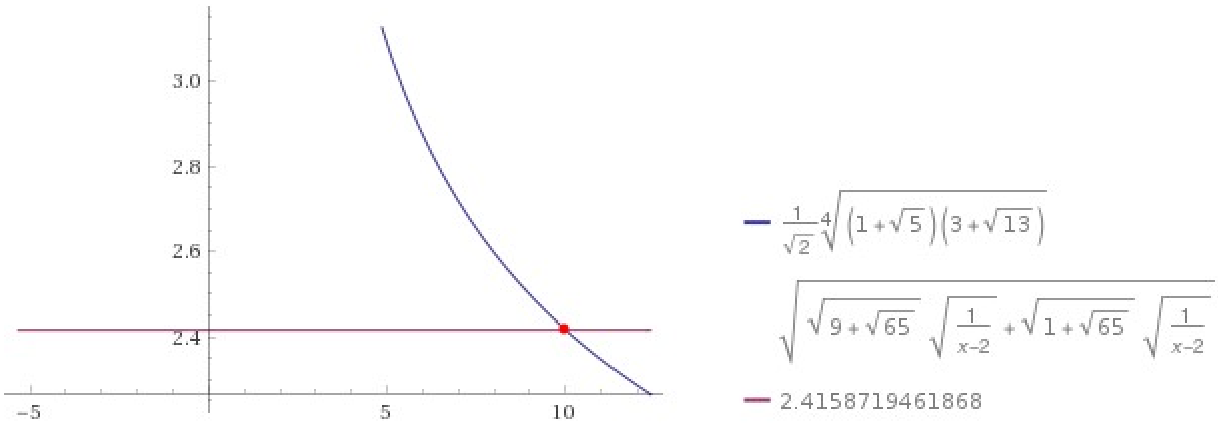
$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{9+\sqrt{65}}{x-2}}+\sqrt{\frac{1+\sqrt{65}}{x-2}}} = 2.4158719461868$$

Result:

$$\frac{\sqrt[4]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{9+\sqrt{65}}\sqrt{\frac{1}{x-2}}+\sqrt{1+\sqrt{65}}\sqrt{\frac{1}{x-2}}}}{\sqrt{2}} =$$

2.4158719461868

Plot:



Solution:

$x = 10$

Integer solution:

$x = 10$

10 (dimensions number in Superstring theory)

[((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/(x*1/3))+sqrt((1+65^0.5)/(x*1/3)))))^1/2 = 2.4158719461868

Input interpretation:

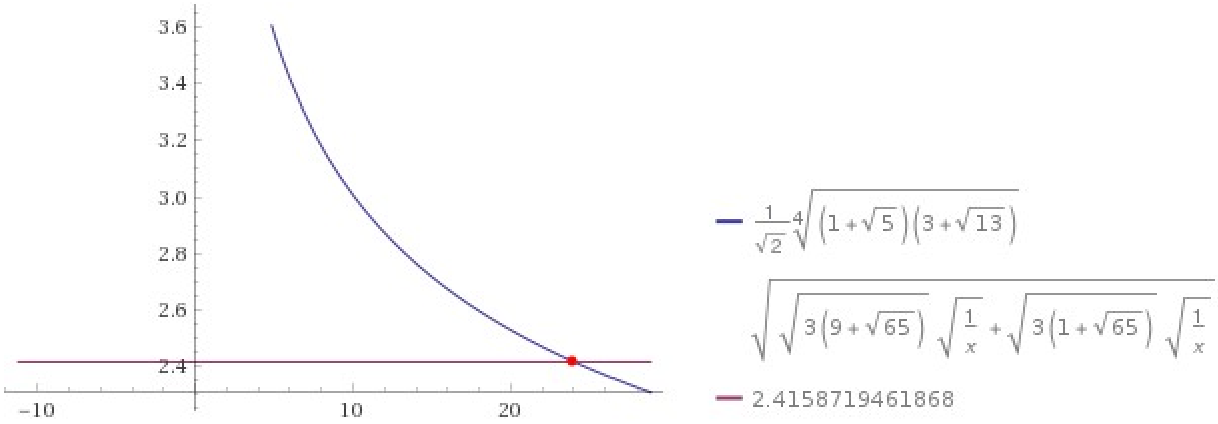
$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{9+\sqrt{65}}{x\times\frac{1}{3}}}+\sqrt{\frac{1+\sqrt{65}}{x\times\frac{1}{3}}}} = 2.4158719461868$$

Result:

$$\frac{\sqrt[4]{(1+\sqrt{5})(3+\sqrt{13})}\ \sqrt{\sqrt{3\left(9+\sqrt{65}\right)}\ \sqrt{\frac{1}{x}}+\sqrt{3\left(1+\sqrt{65}\right)}\ \sqrt{\frac{1}{x}}}}{\sqrt{2}} =$$

2.4158719461868

Plot:



Solution:

$x = 24$

Integer solution:

$x = 24$

24

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

[((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 ((((sqrt((9+65^0.5)/((x*1/3)-2/3)))+sqrt((1+65^0.5)/((x*1/3)-2/3)))))^1/2 = 2.4158719461868

Input interpretation:

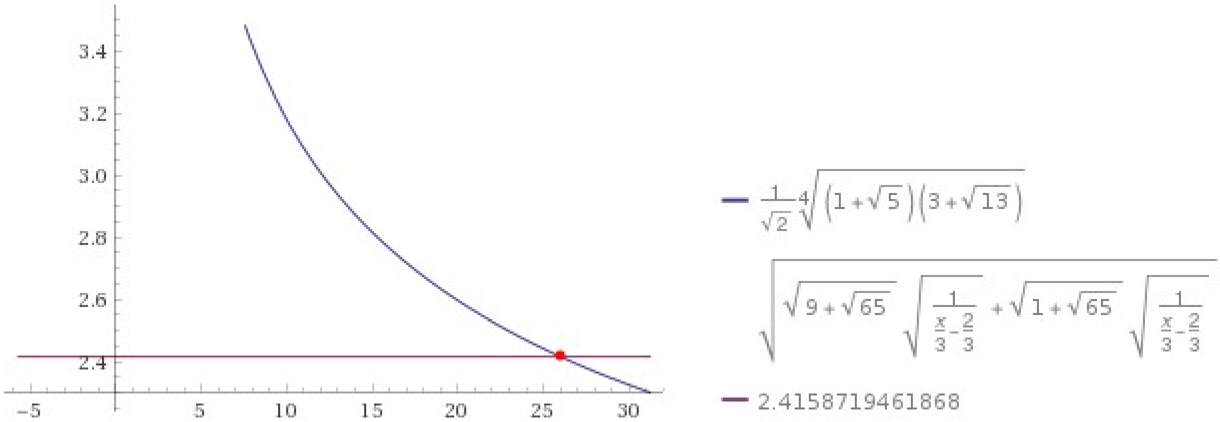
$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\ \sqrt{\sqrt{\frac{9+\sqrt{65}}{x\times\frac{1}{3}-\frac{2}{3}}}+\sqrt{\frac{1+\sqrt{65}}{x\times\frac{1}{3}-\frac{2}{3}}}} = 2.4158719461868$$

Result:

$$\frac{\sqrt[4]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt{\sqrt{9+\sqrt{65}}\sqrt{\frac{1}{\frac{x}{3}-\frac{2}{3}}}+\sqrt{1+\sqrt{65}}\sqrt{\frac{1}{\frac{x}{3}-\frac{2}{3}}}}}{\sqrt{2}} =$$

2.4158719461868

Plot:



Solution:

$x = 26$

26 (dimensions number in bosonic string theory)

From the previous Ramanujan expression

$$e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}$$

we have:

(((e^(Pi*sqrt65)-24+276*e^(-Pi*sqrt65))))^1/4 - 18 + Pi

Input:

$$\sqrt[4]{e^{\pi\sqrt{65}} - 24 + 276\, e^{-\pi\sqrt{65}}} - 18 + \pi$$

Exact result:

$$-18 + \sqrt[4]{-24 + 276\, e^{-\sqrt{65}\,\pi} + e^{\sqrt{65}\,\pi}} + \pi$$

Decimal approximation:

547.4679724479696711078215509400894231688865989504543944248...

547.4679724479… result practically equal to the rest mass of Eta meson 547.862 that we have obtained performing the 4th root, subtracting 18, that is a Lucas number (linked to golden ratio), and adding π

Alternate forms:

$$-18 + e^{-(\sqrt{65}\,\pi)/4} \sqrt[4]{276 - 24 e^{\sqrt{65}\,\pi} + e^{2\sqrt{65}\,\pi}} + \pi$$

$$e^{-(\sqrt{65}\,\pi)/4} \left(-18 e^{(\sqrt{65}\,\pi)/4} + \sqrt[4]{276 - 24 e^{\sqrt{65}\,\pi} + e^{2\sqrt{65}\,\pi}} + e^{(\sqrt{65}\,\pi)/4}\,\pi\right)$$

Series representations:

$$\sqrt[4]{e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}} - 18 + \pi = -18 + \sqrt[4]{-24 + 276 e^{-\pi\sqrt{64}\sum_{k=0}^{\infty} 64^{-k}\binom{1/2}{k}} + e^{\pi\sqrt{64}\sum_{k=0}^{\infty} 64^{-k}\binom{1/2}{k}}} + \pi$$

$$\sqrt[4]{e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}} - 18 + \pi = -18 + \sqrt[4]{-24 + 276 \exp\left(-\pi\sqrt{64}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{64}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right) + e^{\pi\sqrt{64}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{64}\right)^k \left(-\frac{1}{2}\right)_k}{k!}}} + \pi$$

$$\sqrt[4]{e^{\pi\sqrt{65}} - 24 + 276 e^{-\pi\sqrt{65}}} - 18 + \pi = -18 + \left(-24 + 276 \exp\left(-\frac{\pi\sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 64^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right) + \exp\left(\frac{\pi\sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 64^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)\right)\hat{}\,(1/4) + \pi$$

From the initial formula

$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}$$

we have also:

(((((([((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/8)+sqrt((1+65^0.5)/8))))^1/2)))))^6-64+golden ratio^2

Input:

$$\left(\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)^6-64+\phi^2$$

ϕ is the golden ratio

Exact result:

$$\phi^2-64+\frac{1}{8}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}\right)^3$$

Decimal approximation:

137.43043220895391474004100060746134732806935785485351O9962...

137.4304322…

This result is very near to the inverse of fine-structure constant 137,035 that we have obtained subtracting $64 = 8^2$ and adding the square of golden ratio

Alternate forms:

$$\phi^2-64+\frac{1}{512}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}\right)^3$$

$$\frac{1}{512}\left(512\phi^2-32768+\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}\right)^3\right)$$

$$\phi^2-64+\frac{1}{512}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{2\left(1+\sqrt{65}\right)}+\sqrt{2\left(9+\sqrt{65}\right)}\right)^3$$

Minimal polynomial:

$$x^8+300x^7+21890x^6-2728960x^5-640057523x^4-53341132940x^3-2333619480060x^2-53575930102100x-511557630999769$$

(((((([((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/8)+sqrt((1+65^0.5)/8))))^1/2)))))^6-76+golden ratio^2

Input:

$$\left(\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)^6-76+\phi^2$$

ϕ is the golden ratio

Exact result:

$$\phi^2-76+\frac{1}{8}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}\right)^3$$

Decimal approximation:

125.4304322089539147400410006074613473280693578548535109962...

125.4304322089… 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 GeV, that we have obtained subtracting 76, that is a Lucas number, and adding the square of golden ratio

Alternate forms:

$$\phi^2-76+\frac{1}{512}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}\right)^3$$

$$\frac{1}{512}\left(512\,\phi^2-38912+\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}\right)^3\right)$$

$$\phi^2-76+\frac{1}{512}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{2\left(1+\sqrt{65}\right)}+\sqrt{2\left(9+\sqrt{65}\right)}\right)^3$$

Minimal polynomial:

$$x^8+396\,x^7+51\,122\,x^6-148\,912\,x^5-736\,917\,203\,x^4-87\,005\,415\,452\,x^3-4\,845\,606\,479\,820\,x^2-137\,293\,944\,409\,652\,x-1\,596\,558\,217\,731\,721$$

We have also:

(((((([((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/8)+sqrt((1+65^0.5)/8))))^1/2)))))^6-64+Pi+golden ratio

Input:

$$\left(\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)^6-64+\pi+\phi$$

ϕ is the golden ratio

Exact result:

$$\phi-64+\frac{1}{8}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}\right)^3+\pi$$

Decimal approximation:

139.57202486254370797850364399074085021226652725422861681 72...

139.57202486… result practically equal to the rest mass of Pion meson 139.57 MeV that we have obtained 64 = 8^2 and adding π and the golden ratio

Property:

$$-64+\frac{1}{8}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}\right)^3+\phi+\pi$$

is a transcendental number

Alternate forms:

$$\phi-64+\frac{1}{512}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}\right)^3+\pi$$

$$\phi-64+\frac{1}{512}\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{2\left(1+\sqrt{65}\right)}+\sqrt{2\left(9+\sqrt{65}\right)}\right)^3+\pi$$

$$\frac{1}{512}\left(512\phi-32768+\left(\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)\right)^{3/2}\left(\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}\right)^3+512\pi\right)$$

(((1/ sqrt(((([((1+sqrt5)/2) ((3+sqrt13)/2)]^1/4 (((sqrt((9+65^0.5)/8)+sqrt((1+65^0.5)/8))))^1/2))))))^1/496

Input:

$$\sqrt[496]{\frac{1}{\sqrt{\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}}}}$$

Exact result:

$$\frac{\sqrt[1984]{\frac{2}{\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}}}}{\sqrt[3968]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}}$$

Decimal approximation:

0.9991112215321754988038507004743031220098326538064352465 66...

0.9991112215… result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value **$0.989117352243=\phi$** (see Observations for this value).

Alternate forms:

$$\frac{2^{5/3968}}{\sqrt[3968]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\sqrt[1984]{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}}$$

$$\frac{2^{3/1984}\sqrt[1984]{\frac{1}{\sqrt{1-8i}+\sqrt{1+8i}+\sqrt{5}+\sqrt{13}}}}{\sqrt[3968]{(1+\sqrt{5})(3+\sqrt{13})}}$$

All 496th roots of (2/(1/2 sqrt(1/2 (1 + sqrt(65))) + 1/2 sqrt(1/2 (9 + sqrt(65)))))^(1/4)/((1 + sqrt(5)) (3 + sqrt(13)))^(1/8):

$$\frac{\sqrt[1984]{2}\, e^{0}}{\sqrt[3968]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt[1984]{\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}}} \approx 0.9991112$$

(real, principal root)

$$\frac{\sqrt[1984]{2}\, e^{(i\pi)/248}}{\sqrt[3968]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt[1984]{\frac{1}{2}\sqrt{\frac{1}{2}(1+\sqrt{65})}+\frac{1}{2}\sqrt{\frac{1}{2}(9+\sqrt{65})}}}$$

$\approx 0.9990311 + 0.012656\, i$

$$\frac{\sqrt[1984]{2}\, e^{(i\pi)/124}}{\sqrt[3968]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt[1984]{\frac{1}{2}\sqrt{\frac{1}{2}(1+\sqrt{65})}+\frac{1}{2}\sqrt{\frac{1}{2}(9+\sqrt{65})}}}$$

$\approx 0.9987906 + 0.025310\, i$

$$\frac{\sqrt[1984]{2}\, e^{(3i\pi)/248}}{\sqrt[3968]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt[1984]{\frac{1}{2}\sqrt{\frac{1}{2}(1+\sqrt{65})}+\frac{1}{2}\sqrt{\frac{1}{2}(9+\sqrt{65})}}}$$

$\approx 0.9983898 + 0.037960\, i$

$$\frac{\sqrt[1984]{2}\, e^{(i\pi)/62}}{\sqrt[3968]{(1+\sqrt{5})(3+\sqrt{13})}\sqrt[1984]{\frac{1}{2}\sqrt{\frac{1}{2}(1+\sqrt{65})}+\frac{1}{2}\sqrt{\frac{1}{2}(9+\sqrt{65})}}}$$

$\approx 0.9978289 + 0.05060\, i$

Where 496 = 31*8*2. We note that 31 is a twin prime number (29-31) and 29 is a Lucas and prime number. Furthermore 496 is the dimension of the Lie group E_8 x E_8, fundamental in the heterotic string theory.

Observations

DILATON VALUE CALCULATIONS

from:

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

We have that:

5. Since G_n and g_n can be expressed as roots of algebraical equations with rational coefficients, the same is true of G_n^{24} or g_n^{24}. So let us suppose that

$$1 = ag_n^{-24} - bg_n^{-48} + \cdots,$$

or

$$g_n^{24} = a - bg_n^{-24} + \cdots.$$

But we know that

$$\begin{aligned} 64e^{-\pi\sqrt{n}}g_n^{24} &= 1 - 24e^{-\pi\sqrt{n}} + 276e^{-2\pi\sqrt{n}} - \cdots, \\ 64g_n^{24} &= e^{\pi\sqrt{n}} - 24 + 276e^{-\pi\sqrt{n}} - \cdots, \\ 64a - 64bg_n^{-24} + \cdots &= e^{\pi\sqrt{n}} - 24 + 276e^{-\pi\sqrt{n}} - \cdots, \\ 64a - 4096be^{-\pi\sqrt{n}} + \cdots &= e^{\pi\sqrt{n}} - 24 + 276e^{-\pi\sqrt{n}} - \cdots, \end{aligned}$$

that is

$$e^{\pi\sqrt{n}} = (64a + 24) - (4096b + 276)e^{-\pi\sqrt{n}} + \cdots \quad (13)$$

Similarly, if

$$1 = aG_n^{-24} - bG_n^{-48} + \cdots,$$

then

$$e^{\pi\sqrt{n}} = (64a - 24) - (4096b + 276)e^{-\pi\sqrt{n}} + \cdots \quad (14)$$

From (13) and (14) we can find whether $e^{\pi\sqrt{n}}$ is very nearly an integer for given values of n, and ascertain also the number of 9's or 0's in the decimal part. But if G_n and g_n be simple quadratic surds we may work independently as follows. We have, for example,

$$g_{22} = \sqrt{(1 + \sqrt{2})}.$$

Hence

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

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

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

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

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

Now, we have that:

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

phi = -Pi*sqrt(18) + 6C, for C = 1, we obtain:

exp((-Pi*sqrt(18))

Input:

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

Exact result:

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

Decimal approximation:

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

$1.6272016... * 10^{-6}$

Now:

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

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

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

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

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

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

Input interpretation:

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

Result:

0.0066650177536

0.006665017...

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…

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

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

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

= 0.00666501785…

ln(0.00666501784619)

Input interpretation:

log(0.00666501784619)

Result:

-5.010882647757...

-5.010882647757…

Now:

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

For C = 1, we obtain:

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

Note that:

$$g_{22} = \sqrt{(1+\sqrt{2})}.$$

Hence

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

so that

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

Hence

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

Thence:

$$64 g_{22}^{-24} \quad - \qquad 4096 e^{-\pi\sqrt{22}} + \cdots$$

And

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

That are connected with 64, 128, 256, 512, 1024 and 4096 = 64^2

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

“For this reason Ramanujan elaborated a theory of reality around Zero (representing absolute Reality) and Infinity (the manifold manifestations of that reality): their mathematical product represented all the numbers, each of which corresponded to individual acts of creation. For him, "the numbers and their mathematical ratios let us understand how everything was in harmony in the universe".” - (https://www.cittanuova.it/ramanujanhardy-e-il-piacere-di-scoprire/?ms=006&se=007)

Observations

Figs.

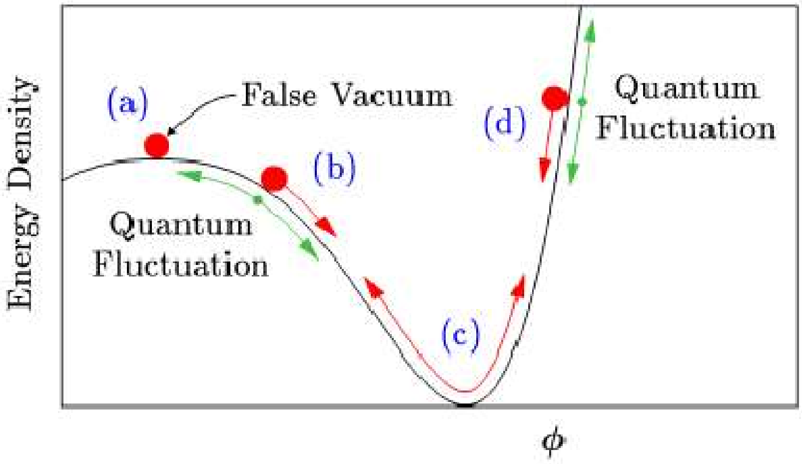
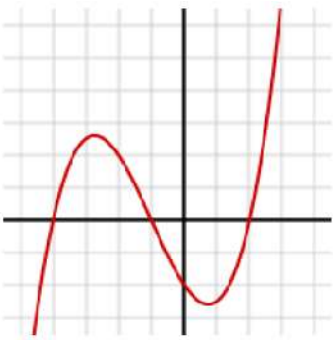


FIG. 1: In simple inflationary models, the universe at early times is dominated by the potential energy density of a scalar field, ϕ. Red arrows show the classical motion of ϕ. When ϕ is near region (a), the energy density will remain nearly constant, $\rho \cong \rho_f$, even as the universe expands. Moreover, cosmic expansion acts like a frictional drag, slowing the motion of ϕ: Even near regions (b) and (d), ϕ behaves more like a marble moving in a bowl of molasses, slowly creeping down the side of its potential, rather than like a marble sliding down the inside of a polished bowl. During this period of "slow roll," ρ remains nearly constant. Only after ϕ has slid most of the way down its potential will it begin to oscillate around its minimum, as in region (c), ending inflation.



Graph of a cubic function with 3 real roots (where the curve crosses the horizontal axis at $y = 0$). The case shown has two critical points. Here the function is $f(x) = (x^3 + 3x^2 - 6x - 8)/4$.

The ratio between M_0 and q

$$M_0 = \sqrt{3q^2 - \Sigma^2},$$

$$q = \frac{(3\sqrt{3})\, M_s}{2}.$$

i.e. the gravitating mass M_0 and the Wheelerian mass q of the wormhole, is equal to:

$$\frac{\sqrt{3\,(2.17049 \times 10^{37})^2 - 0.001^2}}{\frac{1}{2}\,((3\,\sqrt{3})\,(4.2 \times 10^6 \times 1.9891 \times 10^{30}))}$$

1.732050787905194420703947625671018160083566548802082460520...

1.7320507879

$1.7320507879 \approx \sqrt{3}$ that is the ratio between the gravitating mass M_0 and the Wheelerian mass q of the wormhole

We note that:

$$\left(-\frac{1}{2} + \frac{i}{2}\sqrt{3}\right) - \left(-\frac{1}{2} - \frac{i}{2}\sqrt{3}\right)$$

i is the imaginary unit

$$i\sqrt{3}$$

1.732050807568877293527446341505872366942805253810380628055... i

$r \approx 1.73205$ (radius), $\theta = 90°$ (angle)

1.73205

This result is very near to the ratio between M_0 and q, that is equal to 1.7320507879 $\approx \sqrt{3}$

With regard $\sqrt{3}$, we note that is a fundamental value of the formula structure that we need to calculate a Cubic Equation

We have that the previous result

$$\left(-\frac{1}{2}+\frac{i}{2}\sqrt{3}\right)-\left(-\frac{1}{2}-\frac{i}{2}\sqrt{3}\right) = i\sqrt{3} =$$

$$= 1.7320508075688772935274463415058723669428052538103806280 55\ldots\, i$$

$r \approx 1.73205$ (radius), $\theta = 90°$ (angle)

can be related with:

$$u^2(-u)\left(\frac{1}{2}\pm\frac{i\sqrt{3}}{2}\right)+v^2(-v)\left(\frac{1}{2}\pm\frac{i\sqrt{3}}{2}\right)=q$$

Considering:

$$(-1)\left(\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)-(-1)\left(\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)=q$$

$$= i\sqrt{3} = 1.7320508075688772935274463415058723669428052538103806280 55\ldots\, i$$

$r \approx 1.73205$ (radius), $\theta = 90°$ (angle)

Thence:

$$\left(-\frac{1}{2}+\frac{i}{2}\sqrt{3}\right)-\left(-\frac{1}{2}-\frac{i}{2}\sqrt{3}\right) \Rightarrow$$

$$\Rightarrow (-1)\left(\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)-(-1)\left(\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)=q=1.73205\approx\sqrt{3}$$

We observe how the graph above, concerning the cubic function, is very similar to the graph that represent the scalar field (in red). It is possible to hypothesize that cubic functions and cubic equations, with their roots, are connected to the scalar field.

From:
https://www.scientificamerican.com/article/mathematics-ramanujan/?fbclid=IwAR2caRXrn_RpOSvJ1QxWsVLBcJ6KVgd_Af_hrmDYBNyU8mpSjRs1BDeremA

Ramanujan's statement concerned the deceptively simple concept of partitions—the different ways in which a whole number can be subdivided into smaller numbers. Ramanujan's original statement, in fact, stemmed from the observation of patterns, such as the fact that p(9) = 30, p(9 + 5) = 135, p(9 + 10) = 490, p(9 + 15) = 1,575 and so on are all divisible by 5. Note that here the n's come at intervals of five units.

Ramanujan posited that this pattern should go on forever, and that similar patterns exist when 5 is replaced by 7 or 11—there are infinite sequences of p(n) that are all divisible by 7 or 11, or, as mathematicians say, in which the "moduli" are 7 or 11.

Then, in nearly oracular tone Ramanujan went on: "There appear to be corresponding properties," he wrote in his 1919 paper, "in which the moduli are powers of 5, 7 or 11...and no simple properties for any moduli involving primes other than these three." (Primes are whole numbers that are only divisible by themselves or by 1.) Thus, for instance, there should be formulas for an infinity of n's separated by 5^3 = 125 units, saying that the corresponding p(n)'s should all be divisible by 125. In the past methods developed to understand partitions have later been applied to physics problems such as the theory of the strong nuclear force or the entropy of black holes.

From Wikipedia

In particle physics, Yukawa's interaction or Yukawa coupling, named after Hideki Yukawa, is an interaction between a scalar field ϕ and a Dirac field ψ. The Yukawa interaction can be used to describe the nuclear force between nucleons (which are fermions), mediated by pions (which are pseudoscalar mesons). The Yukawa interaction is also used in the Standard Model to describe the coupling between the Higgs field and massless quark and lepton fields (i.e., the fundamental fermion particles). Through spontaneous symmetry breaking, these fermions acquire a mass proportional to the vacuum expectation value of the Higgs field.

Can be this the motivation that from the development of the Ramanujan's equations we obtain results 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 GeV and practically equal to the rest mass of Pion meson 139.57 MeV

Note that:

$$g_{22} = \sqrt{(1+\sqrt{2})}.$$

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

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

Thence:

$$64g_{22}^{-24} = 4096e^{-\pi\sqrt{22}} + \cdots$$

And

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

That are connected with 64, 128, 256, 512, 1024 and 4096 = 64^2

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

All the results of the most important connections are signed in blue throughout the drafting of the paper. We highlight as in the development of the various equations we use always the constants π, ϕ, 1/ϕ, the Fibonacci and Lucas numbers, linked to the golden ratio, that play a fundamental role in the development, and therefore, in the final results of the analyzed expressions.

In mathematics, the Fibonacci numbers, commonly denoted F_n, form a sequence, called the Fibonacci sequence, such that each number is the sum of the two preceding ones, starting from 0 and 1. Fibonacci numbers are strongly related to the golden ratio: Binet's formula expresses the nth Fibonacci number in terms of n and the golden ratio, and implies that the ratio of two consecutive Fibonacci numbers tends to the golden ratio as n increases.
Fibonacci numbers are also closely related to Lucas numbers ,in that the Fibonacci and Lucas numbers form a complementary pair of Lucas sequences

The beginning of the sequence is thus:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229, 832040, 1346269, 2178309, 3524578, 5702887, 9227465, 14930352, 24157817, 39088169, 63245986, 102334155...

The Lucas numbers or Lucas series are an integer sequence named after the mathematician François Édouard Anatole Lucas (1842–91), who studied both that sequence and the closely related Fibonacci numbers. Lucas numbers and Fibonacci numbers form complementary instances of Lucas sequences.

The Lucas sequence has the same recursive relationship as the Fibonacci sequence, where each term is the sum of the two previous terms, but with different starting values. This produces a sequence where the ratios of successive terms approach the golden ratio, and in fact the terms themselves are roundings of integer powers of the golden ratio.[1] The sequence also has a variety of relationships with the Fibonacci numbers, like the fact that adding any two Fibonacci numbers two terms apart in the Fibonacci sequence results in the Lucas number in between.

The sequence of Lucas numbers is:

2, 1, 3, 4, 7, 11, 18, 29, 47, 76, 123, 199, 322, 521, 843, 1364, 2207, 3571, 5778, 9349, 15127, 24476, 39603, 64079, 103682, 167761, 271443, 439204, 710647, 1149851, 1860498, 3010349, 4870847, 7881196, 12752043, 20633239, 33385282, 54018521, 87403803……

All Fibonacci-like integer sequences appear in shifted form as a row of the Wythoff array; the Fibonacci sequence itself is the first row and the Lucas sequence is the second row. Also like all Fibonacci-like integer sequences, the ratio between two consecutive Lucas numbers converges to the golden ratio.

A Lucas prime is a Lucas number that is prime. The first few Lucas primes are:

2, 3, 7, 11, 29, 47, 199, 521, 2207, 3571, 9349, 3010349, 54018521, 370248451, 6643838879, ... (sequence A005479 in the OEIS).

In geometry, a golden spiral is a logarithmic spiral whose growth factor is φ, the golden ratio.[1] That is, a golden spiral gets wider (or further from its origin) by a factor of φ for every quarter turn it makes. Approximate logarithmic spirals can occur in nature, for example the arms of spiral galaxies[3] - golden spirals are one special case of these logarithmic spirals

We note how the following three values: 137.508 (golden angle), 139.57 (mass of the Pion - meson Pi) and 125.18 (mass of the Higgs boson), are connected to each other. In fact, just add 2 to 137.508 to obtain a result very close to the mass of the Pion and subtract 12 to 137.508 to obtain a result that is also very close to the mass of the Higgs boson. We can therefore hypothesize that it is the golden angle (and the related golden ratio inherent in it) to be a fundamental ingredient both in the structures of the microcosm and in those of the macrocosm.

Observations 2

RAMANUJAN-NARDELLI MOCK GENERAL FORMULA THAT FROM THE MASS, TEMPERATURE AND RADIUS OF A QUANTUM OR SUPERMASSIVE BLACK HOLE PROVIDES AN EXCELLENT APPROXIMATION TO ϕ, $1/\phi$, AND ζ(2)

$$\sqrt{\frac{1}{\frac{1.962364415\times 10^{19}}{0.0864055^2}\left(\frac{\pi}{2\times 1.9632648}\times\frac{1}{M}\right)\sqrt{-\frac{T\times 4\pi r^3 - r^2}{6.67\times 10^{-11}}}}} \Rightarrow$$

$$\Rightarrow \quad 6.23179\times 10^{-14}\sqrt{\frac{M}{\sqrt{r^2 - 4\pi r^3 T}}} \Rightarrow$$

$$\Rightarrow \mathbf{1.6182492} \cong \boldsymbol{\phi} = \frac{\sqrt{5}+1}{2} = \mathbf{1.61803398}\ldots$$

EXAMPLE:

$$\sqrt{\left(1\Big/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^{2}}\times\frac{1}{3.170074\times 10^{-19}}\sqrt{-\frac{3.871213\times 10^{41}\times 4\pi(4.707089\times 10^{-46})^{3}-(4.707089\times 10^{-46})^{2}}{6.67\times 10^{-11}}}\right)\right)} \quad (1)$$

≈ 1.6182492….

With $1.897512108 \times 10^{19}$ as mock:

$$\sqrt{\left(1\Big/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^{2}}\times\frac{1}{7.161\times 10^{39}}\sqrt{-\frac{1.713732\times 10^{-17}\times 4\pi(1.063302\times 10^{13})^{3}-(1.063302\times 10^{13})^{2}}{6.67\times 10^{-11}}}\right)\right)} \quad (2)$$

≈ 1.64567...

Inverse formula

$$\frac{1}{\sqrt{\frac{1}{\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^{2}}\times\frac{1}{M}\sqrt{-\frac{T\times 4\pi r^{3}-r^{2}}{6.67\times 10^{-11}}}}}}$$

$$\frac{1.60458\times 10^{13}}{\sqrt{\frac{M}{\sqrt{r^{2}-4\pi r^{3}T}}}}$$

≈ 0.6179517….

This means primarily that as the reciprocal (or counterpart) of the golden ratio exists, there is also the counterpart of a black hole (white hole). Therefore it is mathematically possible to prove the symmetry between them. Furthermore, it is important highlight that the Ramanujan-Nardelli mock formula is ALWAYS valid and not only for the physical parameters of quantum black holes, but also for those of supermassive black holes as SMBH87. Indeed, provides ALWAYS the above excellent approximation to ϕ and $1/\phi$

Applications Ramanujan-Nardelli mock general formula

From:

PHYSICAL REVIEW D 89, 115017 (2014)

Self-interacting dark matter from a non-Abelian hidden sector

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(Received 17 February 2014; published 16 June 2014)

around 100 MeV. Alternatively, the hidden sector may be a supersymmetric pure gauge theory with a ~10 TeV gluino thermal relic. In this case, the dark matter is largely composed of glueballinos that strongly

In fact, however, we will show that all of these features are present in a supersymmetric version of the hidden glueball scenario, in which the hidden sector is a supersymmetric pure gauge theory. In this model, the dark matter is a ~10 TeV hidden gluino, which freezes out in the early Universe when the temperature is high. At freeze-out, the

The thermally averaged transfer cross section, then, depends on four parameters: m_X, Λ, α, and $V_{\rm max}$. In Fig. 4, we plot the ratio $\langle\sigma_T\rangle/m_X$ in the (m_X, Λ) plane for $\alpha = 1$ and three representative characteristic velocities: $V_{\rm max} = 40$ km/s for dwarfs, $V_{\rm max} = 100$ km/s for LSBs, and $V_{\rm max} = 1000$ km/s for clusters. For masses $m_X \sim 1$ TeV and $\Lambda \sim 10$ MeV, we achieve transfer cross sections around the targeted range between 0.1 cm^2/g and

The particle spectrum in AMSB models is completely specified by quantum numbers, dimensionless couplings, and the gravitino mass. In the visible sector, the wino mass limit $m_{\tilde{W}} \gtrsim 100$ GeV implies

$$m_{3/2} \gtrsim 37 \text{ TeV}. \quad (17)$$

preferred range. The red, shaded region is excluded by null searches for visible-sector winos at LEP2. The yellow dot in the top panel defines a representative model with $m_X \simeq 14$ TeV, $\Lambda \simeq 0.35$ MeV, $N = 2$, and $\xi_f \simeq 0.02$.

Of course, the goal is not simply to obtain a multi-component model of dark matter with the correct relic densities, but to obtain self-interacting dark matter. The regions with the preferred self-interaction cross sections are also shown in Fig. 5. For values of $m_X \sim 10$ TeV, $\Lambda \sim 1$ MeV, $2 \leq N \lesssim 10$, and $10^{-3} \lesssim \xi_f \lesssim 10^{-2}$, we find models that satisfy the relic density constraints and also satisfy the scattering constraints for dwarfs and LSBs. Viable models also exist for the lower values of m_X down to the LEP2 limit for the larger values of N and lower values of ξ_f. A representative model is one with $m_X \simeq 14$ TeV, $\Lambda \simeq 0.35$ MeV, $N = 2$, and $\xi_f \simeq 0.02$; this is shown as a yellow dot in Fig. 5. For these parameters, Fig. 1 shows how the dark matter coupling behaves from the scale m_X down to confinement.

self-interaction cross sections are in the preferred range. The red, shaded region is excluded by null searches for visible-sector winos at LEP2. The yellow dot defines a representative model with $m_X \sim 2.5$ TeV, $\Lambda \sim 1.4$ MeV, and $N = 2$.

To give a concrete example, consider the following parameters: $N = 2$, $m_X = 2.5$ TeV, $\Lambda \simeq 1.4$ MeV, $m_C = 0.5$ TeV, $m_R = 1$ GeV, $g_h = 1.1$, $\lambda_R = 1.6$, and $g_\nu = 0.1$. The output glueball relic density is ~5% of the total dark matter abundance. We find this result by numerically solving the coupled Boltzmann equations for the gluons and right-handed neutrinos:

The average is: (10+14+2.5) ÷ 3 = 8,83333333333333. From the sum of two values of Ramanujan mock theta functions, we obtain:

8,044256216625 + 0,8094974 = 8.853753616625 TeV

We insert this value, converted in Kg, in the Hawking Radiation Calculator.

Input interpretation:

convert 8.853753616625 TeV/c^2 to kilograms

Result:

$1.57832465396 \times 10^{-23}$ kg (kilograms)

Mass = 1.578325e-23 Kg

Radius = 2.343578e-50 m

Temperature = 7.775353e+45 Kelvin

Now, we insert these values in the Ramanujan-Nardelli mock formula:

sqrt[[[[1/((((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.578325e-23)* sqrt[[-(((((7.775353e+45 * 4*Pi*(2.343578e-50)^3-(2.343578e-50)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1\left/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times \frac{1}{1.578325\times 10^{-23}}\sqrt{-\frac{7.775353\times 10^{45}\times 4\,\pi\,(2.343578\times 10^{-50})^3-(2.343578\times 10^{-50})^2}{6.67\times 10^{-11}}}\right)\right.\right)}$$

Result:

1.618249337925295708749587098205865064425837873342741231871...

1.6182493… ≈ ϕ = 1.61803398...

For the same formula, but with the Ramanujan mock theta function **F(q) = 1.897512108...** , we obtain (Ramanujan-Nardelli second mock Formula):

sqrt[[[[1/((((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(1.578325e-23)* sqrt[[-(((((7.775353e+45 * 4*Pi*(2.343578e-50)^3-(2.343578e-50)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1 / \left(\frac{4 \times 1.897512108 \times 10^{19}}{5 \times 0.0864055^2} \times \frac{1}{1.578325 \times 10^{-23}} \sqrt{-\frac{7.775353 \times 10^{45} \times 4 \pi (2.343578 \times 10^{-50})^3 - (2.343578 \times 10^{-50})^2}{6.67 \times 10^{-11}}}\right)\right)}$$

Result:

1.645670901387292705181060766136234654443846279466742495090...

$1.64567\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

2sqrt((((6*sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(1.578325e-23)* sqrt[[-((((((7.775353e+45 * 4*Pi*(2.343578e-50)^3-(2.343578e-50)^2))))) / ((6.67*10^-11))]]]]]]))))

Input interpretation:

$$2 \sqrt{\left(6 \sqrt{\left(1 / \left(\frac{4 \times 1.897512108 \times 10^{19}}{5 \times 0.0864055^2} \times \frac{1}{1.578325 \times 10^{-23}} \sqrt{\left(-\frac{1}{6.67 \times 10^{-11}} (7.775353 \times 10^{45} \times 4 \pi (2.343578 \times 10^{-50})^3 - (2.343578 \times 10^{-50})^2)\right)}\right)\right)}\right)}$$

Result:

6.284592399932952288547858966291804552251412716870451183788...

$6.28459\ldots \approx C = 2\pi$

Note that:

Input interpretation:

$$\frac{6.284592399932952288547858966291804552251412716870451 1}{2 \pi}$$

Result:

1.000223945767086954067967730370083469946630199572093 3...

1.000223945767…

From the Ramanujan better approximate formula for ellipse perimeter,

$$p \approx \pi \left[3(a+b) - \sqrt{(3a+b)(a+3b)}\right]$$

we obtain:

Pi(3*(1.000223945767+1.000223945767)-sqrt(((3*1.000223945767+1.000223945767)*(1.000223945767+3*1.000223945767)))

Input interpretation:

$$\pi\left(3(1.000223945767 + 1.000223945767) - \sqrt{(3\times 1.000223945767 + 1.000223945767)(1.000223945767 + 3\times 1.000223945767)}\right)$$

Result:

6.28459239993...

6.28459… that is the ellipse perimeter

Series representations:

$$\pi\left(3(1.0002239457670000 + 1.0002239457670000) - \sqrt{(3\times 1.0002239457670000 + 1.0002239457670000)(1.0002239457670000 + 3\times 1.0002239457670000)}\right) = 6.001343674602000\,\pi - 1.0000000000000000\,\pi\sqrt{15.007167066971305}\sum_{k=0}^{\infty} e^{-2.7085278914547579 k}\binom{\frac{1}{2}}{k}$$

$$\pi\left(3(1.0002239457670000 + 1.0002239457670000) - \sqrt{(3\times 1.0002239457670000 + 1.0002239457670000)(1.0002239457670000 + 3\times 1.0002239457670000)}\right) = 6.001343674602000\,\pi - 1.0000000000000000\,\pi\sqrt{15.007167066971305}\sum_{k=0}^{\infty}\frac{(-0.06663482824822157)^k\left(-\frac{1}{2}\right)_k}{k!}$$

$$\pi\left(3(1.0002239457670000 + 1.0002239457670000) - \sqrt{(3\times 1.0002239457670000 + 1.0002239457670000)(1.0002239457670000 + 3\times 1.0002239457670000)}\right) = 6.0013436746020000\,\pi - \frac{\pi\sum_{j=0}^{\infty}\text{Res}_{s=-\frac{1}{2}+j}\, e^{-2.708527891454757 9 s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}$$

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

$n!$ is the factorial function
$(a)_n$ is the Pochhammer symbol (rising factorial)
$\Gamma(x)$ is the gamma function
$\underset{z=z_0}{\text{Res}} f$ is a complex residue

With regard the value 8.853753616625 TeV, we obtain also:

(-89 -21) + 10^4 * 1 /(8.853753616625)

Input interpretation:

$$(-89-21)+10^4\times\frac{1}{8.853753616625}$$

Result:

1019.46445462664032595532188528408715340260328395424516944 5...

1019.46445… result practically equal to the rest mass of Phi meson 1019.445

And:

8.853753616625 TeV = GeV

Input interpretation:

convert 8.853753616625 TeV (teraelectronvolts) to gigaelectronvolts

Result:

8853.753616625 GeV (gigaelectronvolts)

8853.7536… GeV

Now, from the 14th root of the following Ramanujan's class invariant $Q = \left(G_{505}/G_{101/5}\right)^3$ = 1164,2696, we obtain:

((((((([(((((((((((sqrt((113+5sqrt(505))/8)))))) + (sqrt((105+5sqrt(505))/8))))))))))^3])))))))^(1/14)))))))))

Input:

$$\sqrt[14]{\left(\sqrt{\frac{1}{8}\left(113+5\sqrt{505}\right)}+\sqrt{\frac{1}{8}\left(105+5\sqrt{505}\right)}\right)^3}$$

Exact result:

$$\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(105+5\sqrt{505}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(113+5\sqrt{505}\right)}\right)^{3/14}$$

Decimal approximation:

1.655784548804744724619349561761107639558068114480697960239...

1.65578...

And:

(8853.753616625)/ ((((((((((3 ((((((([((((((((((sqrt((113+5sqrt(505))/8)))))) + (sqrt((105+5sqrt(505))/8)))))))))^3])))))))^(1/14)))))))))

Input interpretation:

$$\frac{8853.753616625}{3\sqrt[14]{\left(\sqrt{\frac{1}{8}\left(113+5\sqrt{505}\right)}+\sqrt{\frac{1}{8}\left(105+5\sqrt{505}\right)}\right)^3}}$$

Result:

1782.388419841...

1782.388... GeV result in the range of hypothetical mass of Gluino (gluino = 1785.16 GeV).

We have also that (for the Ramanujan-Nardelli mock formula):

9.9984933327737e-36 sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.578325e-23)* sqrt[[-(((((7.775353e+45 * 4*Pi*(2.343578e-50)^3-(2.343578e-50)^2))))) / ((6.67*10^-11))]]]]]

where (1.898607e-35)/1.8988931 =

= 9.9984933327737090624006164433374369520854017532635196 × 10^-36

Input interpretation:

$$9.9984933327737\times10^{-36}\sqrt{\left(1\Bigg/\left(\frac{4\times1.962364415\times10^{19}}{5\times0.0864055^2}\times\frac{1}{1.578325\times10^{-23}}\sqrt{-\frac{7.775353\times10^{45}\times4\pi\left(2.343578\times10^{-50}\right)^3-\left(2.343578\times10^{-50}\right)^2}{6.67\times10^{-11}}}\right)\right)}$$

Result:

$1.61801...\times10^{-35}$

$1.61801\ldots * 10^{-35}$ result very near to the value of Planck length

Now, for 10 TeV, we have:

Input interpretation:

convert 10 TeV/c^2 to kilograms

Result:

1.783×10^{-23} kg (kilograms)

$1.783 * 10^{-23}$ kg

Mass = 1.783000e-23

Radius = 2.647490e-50

Temperature = 6.882800e+45

Now, we insert these values in the Ramanujan-Nardelli mock formula:

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.783000e-23)* sqrt[[-(((((6.882800e+45 * 4*Pi*(2.647490e-50)^3-(2.647490e-50)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{1/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times \frac{1}{1.783000\times 10^{-23}}\sqrt{-\frac{6.882800\times 10^{45}\times 4\pi\,(2.647490\times 10^{-50})^3-(2.647490\times 10^{-50})^2}{6.67\times 10^{-11}}}\right)}$$

Result:

1.618249322281036615536110296392444708572935782264897943653...

1.61824932…..

For the same formula, but with the Ramanujan mock theta function **F(q) = 1.897512108...** , we obtain (Ramanujan-Nardelli second mock formula):

sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(1.783000e-23)* sqrt[[-(((((6.882800e+45 * 4*Pi*(2.647490e-50)^3-(2.647490e-50)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.783000\times 10^{-23}}\sqrt{-\frac{6.882800\times 10^{45}\times 4\pi(2.647490\times 10^{-50})^3-(2.647490\times 10^{-50})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.6456708854779384665615793650601003916243016879650690066 70...

1.6456708…

We have also that:

(-5+144)+10^3*sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(1.783e-23)* sqrt[[-(((((6.882800e+45 * 4*Pi*(2.647490e-50)^3-(2.647490e-50)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$(-5+144)+10^3\sqrt{\left(1/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.783\times 10^{-23}}\sqrt{-\frac{6.882800\times 10^{45}\times 4\pi(2.647490\times 10^{-50})^3-(2.647490\times 10^{-50})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1784.67...

1784.67….

result in the range of the hypothetical mass of Gluino (gluino = 1785.16 GeV).

And:

-(sqrt729)+10^2*sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(1.783e-23)* sqrt[[-(((((6.882800e+45 * 4*Pi*(2.647490e-50)^3-(2.647490e-50)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$-\sqrt{729}+10^2\sqrt{\left(1/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.783\times 10^{-23}}\sqrt{-\frac{6.882800\times 10^{45}\times 4\pi(2.647490\times 10^{-50})^3-(2.647490\times 10^{-50})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

137.567...

137.567…. result very near to the mean of the rest masses of two Pion mesons 134.9766 and 139.57 that is 137.2733

Now, for 2.5 TeV, we have:

Input interpretation:

convert 2.5 TeV/c^2 to kilograms

Result:

4.46×10^{-24} kg (kilograms)

$4.46 * 10^{-24}$ kg

Mass = 4.460000e-24

Radius = 6.622438e-51

Temperature = 2.751577e+46

Now, we insert these values in the Ramanujan-Nardelli mock formula:

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((2.751577e+46 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{4.46\times 10^{-24}}\sqrt{-\frac{2.751577\times 10^{46}\times 4\pi(6.622438\times 10^{-51})^3-(6.622438\times 10^{-51})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.618249215993256829425609049987943215739586241434081926654...

1.618249215…

For the same formula, but with the Ramanujan mock theta function **F(q) = 1.897512108...** , we obtain (Ramanujan-Nardelli second mock formula):

sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((2.751577e+46 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{4.46\times 10^{-24}}\sqrt{-\frac{2.751577\times 10^{46}\times 4\pi(6.622438\times 10^{-51})^3-(6.622438\times 10^{-51})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.645670777389090680400928762821067485039313445417999994323...

1.64567077… ≈ ζ(2) = $\frac{\pi^2}{6}$ = 1.644934 ...

We have also that:

(-5+144)+10^3*sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((2.751577e+46 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$(-5+144)+10^3\sqrt{\left(1/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{4.46\times 10^{-24}}\sqrt{-\frac{2.751577\times 10^{46}\times 4\pi(6.622438\times 10^{-51})^3-(6.622438\times 10^{-51})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1784.67...

1784.67… result in the range of the hypothetical mass of Gluino (gluino = 1785.16 GeV).

And:

-(sqrt729)+10^2*sqrt[[[[1/(((((((4*1.897512108e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((2.751577e+46 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$-\sqrt{729}+10^2\sqrt{\left(1/\left(\frac{4\times 1.897512108\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{4.46\times 10^{-24}}\sqrt{-\frac{2.751577\times 10^{46}\times 4\pi\,(6.622438\times 10^{-51})^3-(6.622438\times 10^{-51})^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

137.567…

137.567… result very near to the mean of the rest masses of two Pion mesons 134.9766 and 139.57 that is 137.2733

We note these further interesting mathematical connections:

Entropy = 2.291196e-31

Surface area = 5.511193e-100

Lifetime = 7.458561e-87

Now, we insert these values in the Ramanujan-Nardelli mock formula:

Entropy

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((2.291196e-31 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{4.46\times 10^{-24}}\sqrt{-\frac{2.291196\times 10^{-31}\times 4\pi\left(6.622438\times 10^{-51}\right)^3-\left(6.622438\times 10^{-51}\right)^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.6173220273230141694714581237275639569692620897396705918 63...

1.617322027…

Surface area

sqrt[[[[1/((((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((5.511193e-100 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\frac{1}{\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{4.46\times 10^{-24}}\sqrt{-\frac{\frac{5.511193}{10^{100}}\times 4\pi\left(6.622438\times 10^{-51}\right)^3-\left(6.622438\times 10^{-51}\right)^2}{6.67\times 10^{-11}}}}}$$

Result:

1.6173220273230141694714581237275639569692620897396705918 63...

1.617322027…..

Lifetime

sqrt[[[[1/((((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(4.46e-24)* sqrt[[-(((((7.458561e-87 * 4*Pi*(6.622438e-51)^3-(6.622438e-51)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1 \Big/ \left(\frac{4 \times 1.962364415 \times 10^{19}}{5 \times 0.0864055^2} \times \frac{1}{4.46 \times 10^{-24}} \sqrt{-\frac{7.458561 \times 10^{-87} \times 4\pi (6.622438 \times 10^{-51})^3 - (6.622438 \times 10^{-51})^2}{6.67 \times 10^{-11}}}\right)\right)}$$

Result:

1.617322027323014169471458123727563956969262089739670591863...

1.617322027…

The most significant and interesting result is that inserting indifferently the values of the temperature, the Entropy, the Surface area or Lifetime, the result is always very close to the golden ratio!

Return to the following previous value:

8.4588897096614e-14 eV

Input interpretation:

convert $8.4588897096614 \times 10^{-14}$ eV/c^2 to kilograms

Result:

$1.5079337817599 \times 10^{-49}$ kg (kilograms)

$1.5079337817599 * 10^{-49}$ kg

Mass = 1.507934e-49

Radius = 2.239058e-76

Temperature = 8.138310e+71

Surface area = 6.299999e-151

Entropy = 2.619130e-82

Lifetime = 2.882686e-163

From the following fourth Ramanujan-Nardelli mock GENERAL FORMULA, we obtain for these other results:

Surface area

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.507934e-49)* sqrt[[-(((((6.299999e-151 * 4*Pi*(2.239058e-76)^3-(2.239058e-76)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.507934\times 10^{-49}}\sqrt{-\frac{\frac{6.299999}{10^{151}}\times 4\pi\left(2.239058\times 10^{-76}\right)^3-\left(2.239058\times 10^{-76}\right)^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.617322087497014110863805772804110302752512432028583797462...

1.61732208…

Entropy

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.507934e-49)* sqrt[[-(((((2.619130e-82 * 4*Pi*(2.239058e-76)^3-(2.239058e-76)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.507934\times 10^{-49}}\sqrt{-\frac{2.619130\times 10^{-82}\times 4\pi\left(2.239058\times 10^{-76}\right)^3-\left(2.239058\times 10^{-76}\right)^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.617322087497014110863805772804110302752512432028583797462...

1.61732208…

Lifetime

sqrt[[[[1/(((((((4*1.962364415e+19)/(5*0.0864055^2)))*1/(1.507934e-49)* sqrt[[-(((((2.882686e-163 * 4*Pi*(2.239058e-76)^3-(2.239058e-76)^2))))) / ((6.67*10^-11))]]]]]

Input interpretation:

$$\sqrt{\left(1\Big/\left(\frac{4\times 1.962364415\times 10^{19}}{5\times 0.0864055^2}\times\frac{1}{1.507934\times 10^{-49}}\sqrt{-\frac{\frac{2.882686}{10^{163}}\times 4\pi\left(2.239058\times 10^{-76}\right)^3-\left(2.239058\times 10^{-76}\right)^2}{6.67\times 10^{-11}}}\right)\right)}$$

Result:

1.6173220874970141108638057728041103027525124320285837974 62...

1.61732208…

CONCLUSIONS

All the results of the most important connections are signed in blue throughout the drafting of the paper. We highlight as in the development of the various equations we use always the constants π, ϕ, 1/ϕ, the Fibonacci and Lucas numbers, linked to the golden ratio, that play a fundamental role in the final results of the analyzed expressions.