On the possible mathematical connections between Ramanujan equations, expressions concerning "Pre-Inflationary Climbing Phase" and some sectors of Number Theory

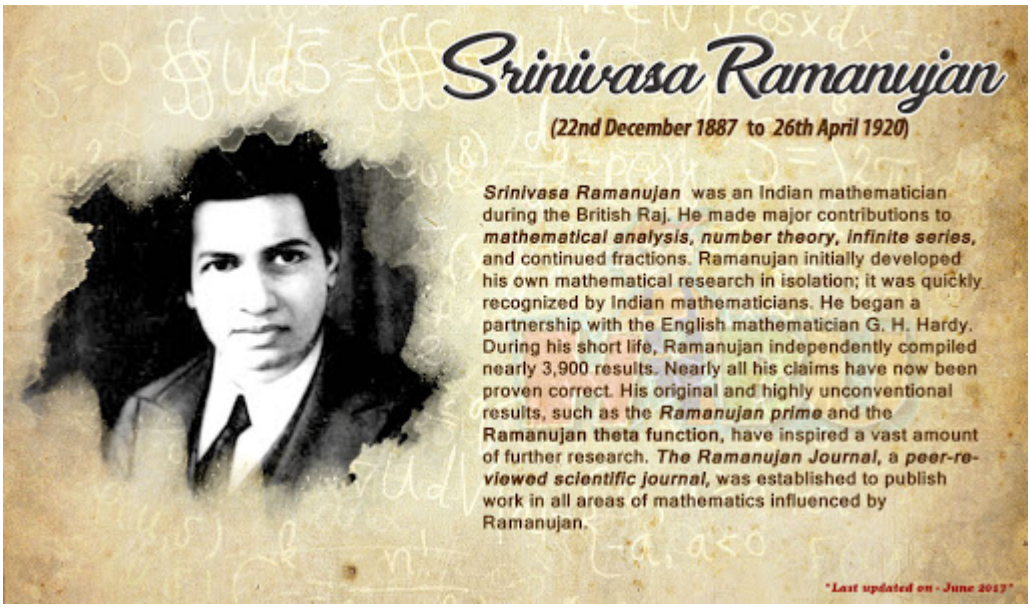
Michele Nardelli[1], Antonio Nardelli[2]

Abstract

In this research thesis, we describe and analyze the possible mathematical connections between Ramanujan equations, expressions concerning "Pre-Inflationary Climbing Phase" and some sectors of Number Theory.

[1] M.Nardelli studied at Dipartimento di Scienze della Terra Università degli Studi di Napoli Federico II, Largo S. Marcellino, 10 - 80138 Napoli, Dipartimento di Matematica ed Applicazioni "R. Caccioppoli" - Università degli Studi di Napoli "Federico II" – Polo delle Scienze e delle Tecnologie Monte S. Angelo, Via Cintia (Fuorigrotta), 80126 Napoli, Italy

[2] A. Nardelli studies at the Università degli Studi di Napoli Federico II - Dipartimento di Studi Umanistici – **Sezione Filosofia - scholar of Theoretical Philosophy**



http://www.eehibu.com/whoami/Srinivasa-Ramanujan

We want to highlight that the development of the various equations was carried out according an our possible logical and original interpretation

Now, from:

CMB Imprints of a Pre-Inflationary Climbing Phase - E. Dudas, N. Kitazawa, S. P. Patil and A. Sagnotti - arXiv:1202.6630v2 [hep-th] 9 May 2012

We have that:

$$V = \frac{M^2}{2}\left(e^{2\varphi} + e^{2\gamma\varphi}\right) = \frac{M^2}{2}\left(e^{\sqrt{6}\phi} + e^{\sqrt{6}\gamma\phi}\right) \quad (2.9)$$

$$V = \frac{M^2}{2}e^{\sqrt{6}\gamma\phi}$$

$$V = \frac{V}{e^{\sqrt{6}\gamma\phi}}\left(e^{\sqrt{6}\phi} + e^{\sqrt{6}\gamma\phi}\right)$$

$$\gamma = \frac{1}{4\sqrt{6}} \text{ and } \phi_0 = -4$$

V/(exp(sqrt6*1/(4sqrt6)*(-4))) * (((exp(sqrt6*(-4))+exp(sqrt6*1/(4sqrt6)*(-4)))))

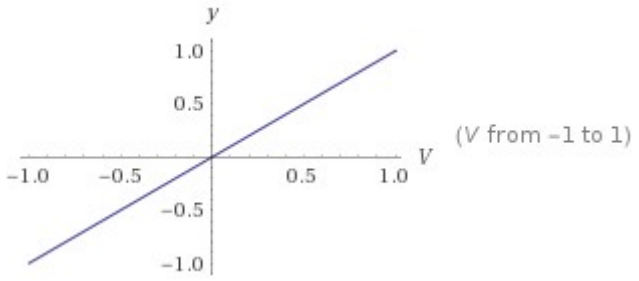
Input:

$$\frac{V}{\exp\left(\sqrt{6}\times\frac{1}{4\sqrt{6}}\times(-4)\right)}\left(\exp\left(\sqrt{6}\times(-4)\right)+\exp\left(\sqrt{6}\times\frac{1}{4\sqrt{6}}\times(-4)\right)\right)$$

Exact result:

$$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)V$$

Plot:



Geometric figure:

line

Alternate forms:

$$\text{Factor}\left[e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)V,\ \text{Extension}\to e^{-4\sqrt{6}}\right]$$

$$e^{1-4\sqrt{6}}\,V+V$$

$$\left(1+e^{1-4\sqrt{6}}\right)V$$

Property as a function:

Parity

odd

Derivative:

$$\frac{d}{dV}\left(\frac{V\left(\exp\left(\sqrt{6}\times(-4)\right)+\exp\left(\frac{\sqrt{6}\times(-4)}{4\sqrt{6}}\right)\right)}{\exp\left(\frac{\sqrt{6}\times(-4)}{4\sqrt{6}}\right)}\right)=e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)$$

Indefinite integral:

$$\int e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)V\,dV=\frac{1}{2}\,e^{1-4\sqrt{6}}\,V^2+\frac{V^2}{2}+\text{constant}$$

$$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)V$$

For V = 1

e (1/e + e^(-4 sqrt(6)))

Input:

$$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)$$

Decimal approximation:

1.000151041039828546730596352095370459788245671116402452711...

1.000151041039…

Property:

$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)$ is a transcendental number

Alternate forms:

$1+e^{1-4\sqrt{6}}$

$e^{-4\sqrt{6}}\left(e+e^{4\sqrt{6}}\right)$

Series representations:

$$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)=1+e^{1-4\sqrt{5}\ \sum_{k=0}^{\infty}5^{-k}\binom{1/2}{k}}$$

$$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)=1+\exp\left(1-4\sqrt{5}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{5}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e\left(\frac{1}{e}+e^{-4\sqrt{6}}\right)=1+\exp\left(1-\frac{2\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j}5^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

For M = 2.435e+18 (that is the Planck mass in GeV), γ = 1/(4sqrt6) , we obtain from (2.9):

$$V=\frac{M^2}{2}\left(e^{2\varphi}+e^{2\gamma\varphi}\right)=\frac{M^2}{2}\left(e^{\sqrt{6}\phi}+e^{\sqrt{6}\gamma\phi}\right)$$

1/2*(2.435e+18)^2 * (((exp(sqrt6*(-4))+exp(sqrt6*1/(4sqrt6)*(-4)))))

Input interpretation:

$$\frac{1}{2}(2.435\times 10^{18})^2\left(\exp\left(\sqrt{6}\times(-4)\right)+\exp\left(\sqrt{6}\times\frac{1}{4\sqrt{6}}\times(-4)\right)\right)$$

Result:

$1.090784718167188211\ldots\times 10^{36}$

$1.090784718167188211\ldots*10^{36}$

For γ = 1/(5sqrt6) , we obtain:

1/2*(2.435e+18)^2 * (((exp(sqrt6*(-4))+exp(sqrt6*1/(5sqrt6)*(-4)))))

Input interpretation:

$$\frac{1}{2}(2.435\times 10^{18})^2\left(\exp\left(\sqrt{6}\times(-4)\right)+\exp\left(\sqrt{6}\times\frac{1}{5\sqrt{6}}\times(-4)\right)\right)$$

Result:

$1.332250992011282257\ldots\times 10^{36}$

$1.332250992\ldots*10^{36}$

For γ = 1/(6sqrt6) , we obtain:

1/2*(2.435e+18)^2 * (((exp(sqrt6*(-4))+exp(sqrt6*1/(6sqrt6)*(-4)))))

Input interpretation:

$$\frac{1}{2}(2.435\times 10^{18})^2\left(\exp\left(\sqrt{6}\times(-4)\right)+\exp\left(\sqrt{6}\times\frac{1}{6\sqrt{6}}\times(-4)\right)\right)$$

Result:

$1.522247537175325892\ldots\times 10^{36}$

$1.5222475371\ldots*10^{36}$

From the three results, with the following calculations, we obtain:

(((ln[1/3(1.090784718167188211*10^36 + 1.332250992*10^36 + 1.5222475371*10^36)]))^1/9

Input interpretation:

$$\log\left(\frac{1}{3}\left(1.090784718167188211\times 10^{36} + 1.332250992\times 10^{36} + 1.5222475371\times 10^{36}\right)\right)\text{ ^ }(1/9)$$

$\log(x)$ is the natural logarithm

Result:

1.63428530817...

$1.63428530817\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Now, we have the following two fractal dimensions:

≈ 1.2619 (Koch curve) + 2 (Pythagoras tree)

log base 3 (4) + ((ln(2)/ (log(2/sqrt2))))

Input:

$$\log_3(4) + \frac{\log(2)}{\log\left(\frac{2}{\sqrt{2}}\right)}$$

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

$\log(x)$ is the natural logarithm

Exact result:

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

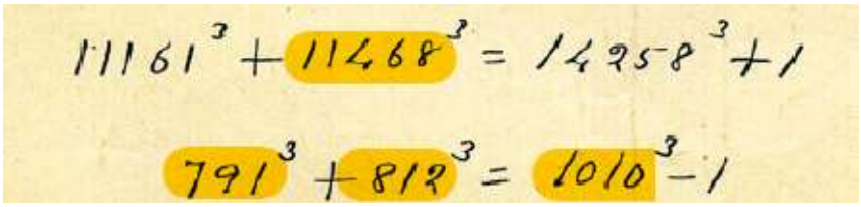
Decimal approximation:

3.261859507142914874199054228685521708599171280263760855741...

3.2618595…

(((log base 3 (4) + ((ln(2)/ (log(2/sqrt2)))))))*(11468*(Pi+e)-1010-812-791)*(1.090784718167188211*10^36 * 1.332250992*10^36 * 1.5222475371*10^36)

Where 11468, 1010, 812 and 791 are cubic roots of Ramanujan numbers



Input interpretation:

$$\left(\log_3(4) + \frac{\log(2)}{\log\left(\frac{2}{\sqrt{2}}\right)}\right)(11468\,(\pi + e) - 1010 - 812 - 791)$$
$$\left(1.090784718167188211 \times 10^{36} \times 1.332250992 \times 10^{36} \times 1.5222475371 \times 10^{36}\right)$$

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

$\log(x)$ is the natural logarithm

Result:

$4.66044877\ldots \times 10^{113}$

$4.66044877\ldots*10^{113}$ result very near to the value of energy density of Planck

4.632947×10^{113} J/m^3

From the sum of the three results, we obtain:

(1.090784718167188211*10^36 + 1.332250992*10^36 + 1.5222475371*10^36)^1/11 - 322- 76 + 4

Input interpretation:

$$\sqrt[11]{1.090784718167188211 \times 10^{36} + 1.332250992 \times 10^{36} + 1.5222475371 \times 10^{36}} - 322 - 76 + 4$$

Result:

1728.8348023...

1728.8348023…

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

From

$$\frac{d\varphi}{d\tau} = \frac{1}{2}\left[\sqrt{\frac{\gamma-1}{\gamma+1}}\cot\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right) - \sqrt{\frac{\gamma+1}{\gamma-1}}\tan\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right], \qquad (2.15)$$

where now $0 < \tau < \frac{\pi}{\sqrt{\gamma^2-1}}$ [17].

for $0 < \gamma < 1$

We consider $\gamma = 0.5$, thence

Pi / sqrt(0.5^2-1)

Input:

$$\frac{\pi}{\sqrt{0.5^2-1}}$$

Result:

-0

$3.62760\ldots\, i$

Polar coordinates:

$r = 3.6276$ (radius), $\theta = -90°$ (angle)

3.6276

We put

$\tau = 2.5$ $(0 < 2.5 < 3.6276)$

Thence:

$$\frac{d\varphi}{d\tau} = \frac{1}{2}\left[\sqrt{\frac{\gamma-1}{\gamma+1}}\cot\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right) - \sqrt{\frac{\gamma+1}{\gamma-1}}\tan\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]$$

1/2[sqrt((0.5-1)/(0.5+1)) cot (2.5/2*sqrt(0.5^2-1)) – sqrt((0.5+1)/(0.5-1)) tan(2.5/2*sqrt(0.5^2-1))]

Input:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\cot\left(\frac{2.5}{2}\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\tan\left(\frac{2.5}{2}\sqrt{0.5^2-1}\right)\right)$$

$\cot(x)$ is the cotangent function

Result:

1.0512504166536391958969107830656031953041323674456942029 19...

1.051250416…

Alternative representations:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right) = \frac{1}{2}\left(-\left(-i+\frac{2i}{1+e^{2.5i\sqrt{-1+0.5^2}}}\right)\sqrt{-\frac{1.5}{0.5}}-i\left(\coth\left((-1.25i)\sqrt{-1+0.5^2}\right)\sqrt{-\frac{0.5}{1.5}}\right)\right)$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right) = \frac{1}{2}\left(\cot\left(-\frac{\pi}{2}+1.25\sqrt{-1+0.5^2}\right)\sqrt{-\frac{1.5}{0.5}}+\left(i+\frac{2i}{-1+e^{2.5i\sqrt{-1+0.5^2}}}\right)\sqrt{-\frac{0.5}{1.5}}\right)$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right) = \frac{1}{2}\left(-\left(-i+\frac{2i}{1+e^{2.5i\sqrt{-1+0.5^2}}}\right)\sqrt{-\frac{1.5}{0.5}}+\left(i+\frac{2i}{-1+e^{2.5i\sqrt{-1+0.5^2}}}\right)\sqrt{-\frac{0.5}{1.5}}\right)$$

Series representations:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$

$$-\frac{1}{2}\,i\sqrt{x}\left(\exp\left(i\pi\left\lfloor\frac{\arg(-3-x)}{2\pi}\right\rfloor\right)\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1+k_2}\,e^{2.5\,i\sqrt{-0.75}\,k_2}\,(-3-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}\,\mathrm{sgn}(k_2)}{k_1!}+\right.$$

$$\left.\exp\left(i\pi\left\lfloor\frac{\arg(-0.333333-x)}{2\pi}\right\rfloor\right)\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,e^{2.5\,i\sqrt{-0.75}\,k_2}\,(-0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}\,\mathrm{sgn}(k_2)}{k_1!}\right)$$

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

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$

$$-0.5\left(i\exp\left(i\pi\left\lfloor\frac{\arg(-3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1+k_2}\,e^{2.5\,i\sqrt{-0.75}\,k_2}\,(-3-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}\,\mathrm{sgn}(k_2)}{k_1!}+\right.$$

$$\left.0.8\exp\left(i\pi\left\lfloor\frac{\arg(-0.333333-x)}{2\pi}\right\rfloor\right)\sqrt{-0.75}\,\sqrt{x}\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,(-0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(-\sqrt{-0.75}^{\,2}+0.64\,\pi^2\,k_2^2\right)}\right)$$ for $(x \in \mathbb{R}$ and $x < 0)$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$

$$-0.5\left(i\exp\left(i\pi\left\lfloor\frac{\arg(-0.333333-x)}{2\pi}\right\rfloor\right)\sqrt{x}\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,e^{2.5\,i\sqrt{-0.75}\,k_2}\,(-0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}\,\mathrm{sgn}(k_2)}{k_1!}+\right.$$

$$10\exp\left(i\pi\left\lfloor\frac{\arg(-3-x)}{2\pi}\right\rfloor\right)\sqrt{-0.75}\,\sqrt{x}$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=1}^{\infty}\frac{(-1)^{k_1}\,(-3-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(-6.25\sqrt{-0.75}^{\,2}+\pi^2\,(1-2\,k_2)^2\right)}\right)\quad\text{for}\ (x\in\mathbb{R}\ \text{and}\ x<0)$$

Integral representation:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$

$$\int_0^{1.25\sqrt{-0.75}}\left(-0.5\sec^2(t)\sqrt{-3}\,+\right.$$

$$\left.\frac{\csc^2\left(0+0.5\pi+t-\frac{0.4\pi t}{\sqrt{-0.75}}\right)\left(0.2\pi-0.5\sqrt{-0.75}\right)\sqrt{-0.333333}}{\sqrt{-0.75}}\right)dt$$

Multiple-argument formulas:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$

$$\frac{1}{4}\sqrt{-0.333333}\left(\cot\left(0.625\sqrt{-0.75}\right)-\tan\left(0.625\sqrt{-0.75}\right)\right)+$$

$$\frac{\sqrt{-3}\,\tan\left(0.625\sqrt{-0.75}\right)}{-1+\tan^2\left(0.625\sqrt{-0.75}\right)}$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$
$$\frac{\cot(0.416667\sqrt{-0.75})\,(-3+\cot^2(0.416667\sqrt{-0.75}))\sqrt{-0.333333}}{-2+6\cot^2(0.416667\sqrt{-0.75})}+$$
$$\frac{\sqrt{-3}\,\tan(0.625\sqrt{-0.75})}{-1+\tan^2(0.625\sqrt{-0.75})}$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)=$$
$$\frac{1}{4}\left(-\frac{2\sqrt{-3}\,\tan(0.416667\sqrt{-0.75})\,(-3+\tan^2(0.416667\sqrt{-0.75}))}{-1+3\tan^2(0.416667\sqrt{-0.75})}+\right.$$
$$\left.\sqrt{-0.333333}\left(\cot\left(0.625\sqrt{-0.75}\right)-\tan\left(0.625\sqrt{-0.75}\right)\right)\right)$$

From which:

(1.051250416)^10

Input interpretation:

1.051250416^{10}

Result:

1.648396966552355824361788125533065486690136473237001513348...

$1.6483969665\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

From

$$\frac{d\varphi}{d\tau} = \frac{1}{2}\left[\sqrt{\frac{1-\gamma}{1+\gamma}}\coth\left(\frac{\tau}{2}\sqrt{1-\gamma^2}\right) - \sqrt{\frac{1+\gamma}{1-\gamma}}\tanh\left(\frac{\tau}{2}\sqrt{1-\gamma^2}\right)\right]. \qquad (2.13)$$

for $0 < \gamma < 1$

$(0 < \tau < \infty)$

considering $\gamma = 0.5$ and $\tau = 128$, we obtain:

$$\frac{1}{2}\left[\sqrt{\frac{1-\gamma}{1+\gamma}}\,\coth\left(\frac{\tau}{2}\sqrt{1-\gamma^2}\right)-\sqrt{\frac{1+\gamma}{1-\gamma}}\,\tanh\left(\frac{\tau}{2}\sqrt{1-\gamma^2}\right)\right]$$

1/2[sqrt((1-0.5)/(1+0.5)) coth (128/2*sqrt(1-0.5^2)) – sqrt((1+0.5)/(1-0.5)) tanh (128/2*sqrt(1-0.5^2))]

Input:

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)$$

$\coth(x)$ is the hyperbolic cotangent function

$\tanh(x)$ is the hyperbolic tangent function

Result:

−0.577350…

-0.577350…

Alternative representations:

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=$$
$$\frac{1}{2}\left(-\left(-1+\frac{2}{1+e^{-128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{1.5}{0.5}}-i\left(\cot\left(-64\,i\sqrt{1-0.5^2}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)$$

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=$$
$$\frac{1}{2}\left(-\left(-1+\frac{2}{1+e^{-128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{1.5}{0.5}}+\left(1+\frac{2}{-1+e^{128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{0.5}{1.5}}\right)$$

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=$$
$$\frac{1}{2}\left(-i\left(\cot\left(\frac{\pi}{2}+64\,i\sqrt{1-0.5^2}\right)\sqrt{\frac{1.5}{0.5}}\right)+\left(1+\frac{2}{-1+e^{128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{0.5}{1.5}}\right)$$

Series representations:

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=32\sqrt{0.75}$$
$$\sqrt{x}\left(-8\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k_1=0}^{\infty}\sum_{k_2=1}^{\infty}\frac{(-1)^{k_1}\,(3-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(16\,384\sqrt{0.75}^{\,2}+\pi^2\,(1-2\,k_2)^2\right)}+\right.$$
$$\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)$$
$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,(0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(4096\sqrt{0.75}^{\,2}+\pi^2\,k_2^2\right)}\right)\quad\text{for}\ (x\in\mathbb{R}\ \text{and}\ x<0)$$

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=$$
$$-\frac{1}{2}\sqrt{x}\left(\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k\,(0.333333-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}-\right.$$
$$\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+$$
$$2\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)$$
$$\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_2}\,q^{2k_1}\,(0.333333-x)^{k_2}\,x^{-k_2}\left(-\frac{1}{2}\right)_{k_2}}{k_2!}-$$
$$\left.2\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1+k_2}\,q^{2k_1}\,(3-x)^{k_2}\,x^{-k_2}\left(-\frac{1}{2}\right)_{k_2}}{k_2!}\right)$$
$$\text{for}\ (x\in\mathbb{R}\ \text{and}\ x<0\ \text{and}\ q=1.17772\times10^{24})$$

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=$$
$$\frac{1}{2}\sqrt{x}\left(\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\right.$$
$$2\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1+k_2}\,q^{2k_1}\,(3-x)^{k_2}\,x^{-k_2}\left(-\frac{1}{2}\right)_{k_2}}{k_2!}+$$
$$64\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\sqrt{0.75}$$
$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,(0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(4096\sqrt{0.75}^{\,2}+\pi^2\,k_2^2\right)}\right)$$
for $(x\in\mathbb{R}$ and $x<0$ and $q=1.17772\times10^{24})$

Integral representation:

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)=$$
$$\int_{\frac{i\pi}{2}}^{64\sqrt{0.75}}\left(-\frac{1}{2}\,\mathrm{csch}^2(t)\sqrt{0.333333}+\frac{64\,\mathrm{sech}^2\left(\frac{64\,(i\pi-2t)\sqrt{0.75}}{i\pi-128\sqrt{0.75}}\right)\sqrt{0.75}\,\sqrt{3}}{i\pi-128\sqrt{0.75}}\right)dt$$

We note that, from the difference of the two results, after some calculations, we obtain:

(((1/2[((1-0.5)/(1+0.5))^0.5 coth (128/2*(1-0.5^2)^0.5) – ((1+0.5)/(1-0.5))^0.5 tanh (128/2*(1-0.5^2)^0.5)])))

Input:

$$\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)$$

$\coth(x)$ is the hyperbolic cotangent function

$\tanh(x)$ is the hyperbolic tangent function

Result:

−0.57735026918962576450914878050195745564760175126846188289...

((1/2[((0.5-1)/(0.5+1))^0.5 cot (2.5/2*(0.5^2-1)^0.5) – ((0.5+1)/(0.5-1))^0.5 tan(2.5/2*(0.5^2-1)^0.5)]))-(-0.5773502691896257645)-(8+2)1/10^3

Input interpretation:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{2.5}{2}\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{2.5}{2}\sqrt{0.5^2-1}\right)\right)-$$
$$-0.5773502691896257645-(8+2)\times\frac{1}{10^3}$$

$\cot(x)$ is the cotangent function

Result:

1.618600685843264960396910783065603195304132367445694202919...

1.618600685…. result that is a very good approximation to the value of the golden ratio 1.618033988749...

Alternative representations:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.5773502691896257645000-\frac{8+2}{10^3}=$$
$$0.5773502691896257645000-\frac{10}{10^3}+$$
$$\frac{1}{2}\left(-i\left(\coth\left((-1.25\,i)\sqrt{-1+0.5^2}\right)\sqrt{-\frac{0.5}{1.5}}\right)-\sqrt{-\frac{1.5}{0.5}}\left(-i+\frac{2\,i}{1+e^{2.5\,i\sqrt{-1+0.5^2}}}\right)\right)$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.5773502691896257645000-\frac{8+2}{10^3}=0.5773502691896257645000-$$
$$\frac{10}{10^3}+\frac{1}{2}\left(\cot\left(-\frac{\pi}{2}+1.25\sqrt{-1+0.5^2}\right)\sqrt{-\frac{1.5}{0.5}}+\sqrt{-\frac{0.5}{1.5}}\left(i+\frac{2\,i}{-1+e^{2.5\,i\sqrt{-1+0.5^2}}}\right)\right)$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.57735026918962576450000-\frac{8+2}{10^3}=0.57735026918962576450000-$$
$$\frac{10}{10^3}+\frac{1}{2}\left(\sqrt{-\frac{0.5}{1.5}}\left(i+\frac{2\,i}{-1+e^{2.5\,i\sqrt{-1+0.5^2}}}\right)-\sqrt{-\frac{1.5}{0.5}}\left(-i+\frac{2\,i}{1+e^{2.5\,i\sqrt{-1+0.5^2}}}\right)\right)$$

Series representations:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.57735026918962576450000-\frac{8+2}{10^3}=0.56735026918962576450000-$$
$$(1.1547\,i)\,i+\sum_{k=1}^{\infty}\left(-0.57735\,i-(1.73205\,i)\,(-1)^k\right)i\,q^{2k}\quad\text{for } q=0.338737$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.57735026918962576450000-\frac{8+2}{10^3}=0.56735026918962576450000+$$
$$\sum_{k=-\infty}^{\infty}\left(-0.288675\,i-(0.866025\,i)\,(-1)^k\right)e^{(2.16506\,i)\,i\,k}\,i\,\mathrm{sgn}(k)$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.57735026918962576450000-\frac{8+2}{10^3}=0.56735026918962576450000+$$
$$\sum_{k=-\infty}^{\infty}\left(\frac{0.3125}{1.17187+k^2\,\pi^2}-(0.866025\,i)\,(-1)^k\,e^{(2.16506\,i)\,i\,k}\,i\,\mathrm{sgn}(k)\right)$$

Integral representation:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.577350269189625764500000-\frac{8+2}{10^3}=0.567350269189625764500000+$$
$$\int_{\frac{\pi}{2}}^{1.08253\,i}\left((-0.288675\,i)\csc^2(t)-\frac{(1.875+0\,i)\sec^2\left(\frac{0\,i+(1.08253\,i)\pi-(2.16506\,i)t}{-2.16506\,i+\pi}\right)}{-2.16506\,i+\pi}\right)dt$$

Multiple-argument formulas:

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.577350269189625764500000-\frac{8+2}{10^3}=0.567350269189625764500000+$$
$$(0.288675\,i)\cot(1.08253\,i)+\frac{(1.73205\,i)\tan(0.541266\,i)}{-1+\tan^2(0.541266\,i)}$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.577350269189625764500000-\frac{8+2}{10^3}=$$
$$0.567350269189625764500000+(0.144338\,i)\cot(0.541266\,i)-$$
$$(0.144338\,i)\tan(0.541266\,i)-(0.866025\,i)\tan(1.08253\,i)$$

$$\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)-$$
$$-0.577350269189625764500000-\frac{8+2}{10^3}=$$
$$0.567350269189625764500000+(0.144338\,i)\cot(0.541266\,i)+$$
$$\tan(0.541266\,i)\left(-0.144338\,i+\frac{1.73205\,i}{-1+\tan^2(0.541266\,i)}\right)$$

Interesting is also this result:

1/(((((((1/2[sqrt((1-0.5)/(1+0.5)) coth (128/2*sqrt(1-0.5^2)) – sqrt((1+0.5)/(1-0.5)) tanh (128/2*sqrt(1-0.5^2))]))))))^12

Input:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)\right)^{12}}$$

$\coth(x)$ is the hyperbolic cotangent function

$\tanh(x)$ is the hyperbolic tangent function

Result:

729.000...

$729 = 27^2 = 9^3$ (Ramanujan cube)

Alternative representations:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}} = \frac{1}{\left(\frac{1}{2}\left(-\left(-1+\frac{2}{1+e^{-128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{1.5}{0.5}}-i\left(\cot\left(-64\,i\sqrt{1-0.5^2}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)\right)^{12}}$$

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}} = \frac{1}{\left(\frac{1}{2}\left(-\left(-1+\frac{2}{1+e^{-128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{1.5}{0.5}}+\left(1+\frac{2}{-1+e^{128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)^{12}}$$

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}} = \frac{1}{\left(\frac{1}{2}\left(-i\left(\cot\left(\frac{\pi}{2}+64\,i\sqrt{1-0.5^2}\right)\sqrt{\frac{1.5}{0.5}}\right)+\left(1+\frac{2}{-1+e^{128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)^{12}}$$

Series representations:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}} =$$

$$1\Big/\left(1\,152\,921\,504\,606\,846\,976\sqrt{0.75}^{12}\sqrt{x}^{12}\left(\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\right.\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,(0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(4096\sqrt{0.75}^{2}+\pi^2\,k_2^2\right)}-\right.$$

$$\left.8\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\right.$$

$$\left.\left.\sum_{k_1=0}^{\infty}\sum_{k_2=1}^{\infty}\frac{(-1)^{k_1}\,(3-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(16\,384\sqrt{0.75}^{2}+\pi^2\,(-1+2\,k_2)^2\right)}\right)^{12}\right)\quad\text{for}\ (x\in\mathbb{R}$$

and $x<0$)

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}} =$$

$$4096\Big/\left(\sqrt{x}^{12}\left(\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^{k}\,(0.333333-x)^{k}\,x^{-k}\left(-\frac{1}{2}\right)_{k}}{k!}-\right.\right.$$

$$\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^{k}\,(3-x)^{k}\,x^{-k}\left(-\frac{1}{2}\right)_{k}}{k!}+$$

$$2\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)$$

$$\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_2}\,q^{2k_1}\,(0.333333-x)^{k_2}\,x^{-k_2}\left(-\frac{1}{2}\right)_{k_2}}{k_2!}-$$

$$2\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)$$

$$\left.\left.\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1+k_2}\,q^{2k_1}\,(3-x)^{k_2}\,x^{-k_2}\left(-\frac{1}{2}\right)_{k_2}}{k_2!}\right)^{12}\right)$$

for ($x\in\mathbb{R}$ and $x<0$ and $q=1.17772\times10^{24}$)

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=4096\Big/$$
$$\left(\sqrt{x}^{12}\left(\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+2\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\right.\right.$$
$$\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1+k_2}\,q^{2k_1}\,(3-x)^{k_2}\,x^{-k_2}\left(-\frac{1}{2}\right)_{k_2}}{k_2!}+$$
$$64\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\sqrt{0.75}$$
$$\left.\left.\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,(0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(4096\sqrt{0.75}^{\,2}+\pi^2\,k_2^2\right)}\right)^{12}\right)$$

for $(x\in\mathbb{R}$ and $x<0$ and $q=1.17772\times10^{24})$

Integral representation:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$
$$\frac{4096}{\left(\int_{\frac{i\pi}{2}}^{64\sqrt{0.75}}\left(\operatorname{csch}^2(t)\sqrt{0.333333}-\frac{128\operatorname{sech}^2\left(\frac{64(i\pi-2t)\sqrt{0.75}}{i\pi-128\sqrt{0.75}}\right)\sqrt{0.75}\,\sqrt{3}}{i\pi-128\sqrt{0.75}}\right)dt\right)^{12}}$$

From which:

10^3+1/(((((((1/2[sqrt((1-0.5)/(1+0.5)) coth (128/2*sqrt(1-0.5^2)) – sqrt((1+0.5)/(1-0.5)) tanh (128/2*sqrt(1-0.5^2))])))))))^12

Input:

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\,\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\,\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)\right)^{12}}$$

$\coth(x)$ is the hyperbolic cotangent function

$\tanh(x)$ is the hyperbolic tangent function

Result:

1729.00...

1729

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

Alternative representations:

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$
$$10^3+\frac{1}{\left(\frac{1}{2}\left(-\left(-1+\frac{2}{1+e^{-128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{1.5}{0.5}}-i\left(\cot\left(-64\,i\sqrt{1-0.5^2}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)\right)^{12}}$$

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$
$$10^3+\frac{1}{\left(\frac{1}{2}\left(-\left(-1+\frac{2}{1+e^{-128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{1.5}{0.5}}+\left(1+\frac{2}{-1+e^{128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)^{12}}$$

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$
$$10^3+\frac{1}{\left(\frac{1}{2}\left(-i\left(\cot\left(\frac{\pi}{2}+64\,i\sqrt{1-0.5^2}\right)\sqrt{\frac{1.5}{0.5}}\right)+\left(1+\frac{2}{-1+e^{128\sqrt{1-0.5^2}}}\right)\sqrt{\frac{0.5}{1.5}}\right)\right)^{12}}$$

Series representations:

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$

$$1000+4096\Bigg/\left(\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\sqrt{x}\left(-1-2\sum_{k=1}^{\infty}q^{2k}\right)\right.$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\,(0.333333-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}-\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\right.$$

$$\left.\sqrt{x}\left(-1-2\sum_{k=1}^{\infty}(-1)^k\,q^{2k}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}$$

for $(x\in\mathbb{R}$ and $x<0$ and $q=1.17772\times10^{24})$

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$

$$1000+4096\Bigg/\left(-\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\left(-1-2\sum_{k=1}^{\infty}(-1)^k\,q^{2k}\right)\right.$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\,(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\right.$$

$$\left.\sqrt{x}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\,(0.333333-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right.$$

$$\left.\left(\frac{1}{64\sqrt{0.75}}+128\sqrt{0.75}\sum_{k=1}^{\infty}\frac{1}{k^2\,\pi^2+4096\sqrt{0.75}^{\,2}}\right)\right)^{12}$$

for $(x\in\mathbb{R}$ and $x<0$ and $q=1.17772\times10^{24})$

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$

$$1000+4096\Bigg/\Bigg(64\exp\left(i\pi\left\lfloor\frac{\arg(0.333333-x)}{2\pi}\right\rfloor\right)\sqrt{0.75}\ \sqrt{x}\sum_{k_1=0}^{\infty}\sum_{k_2=-\infty}^{\infty}\frac{(-1)^{k_1}\,(0.333333-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(4096\sqrt{0.75}^{\,2}+\pi^2\,k_2^2\right)}-512\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{0.75}\ \sqrt{x}\sum_{k_1=0}^{\infty}\sum_{k_2=1}^{\infty}\frac{(-1)^{k_1}\,(3-x)^{k_1}\,x^{-k_1}\left(-\frac{1}{2}\right)_{k_1}}{k_1!\left(16\,384\sqrt{0.75}^{\,2}+\pi^2\,(-1+2k_2)^2\right)}\Bigg)^{12}$$

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

Integral representation:

$$10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128\sqrt{1-0.5^2}}{2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128\sqrt{1-0.5^2}}{2}\right)\right)\right)^{12}}=$$

$$1000+\frac{4096}{\left(\int_{\frac{i\pi}{2}}^{64\sqrt{0.75}}\left(\operatorname{csch}^2(t)\sqrt{0.333333}-\frac{128\operatorname{sech}^2\left(\frac{64(i\pi-2t)\sqrt{0.75}}{i\pi-128\sqrt{0.75}}\right)\sqrt{0.75}\ \sqrt{3}}{i\pi-128\sqrt{0.75}}\right)dt\right)^{12}}$$

From which:

[10^3+1/(((((((1/2[sqrt((1-0.5)/(1+0.5)) coth (128/2*sqrt(1-0.5^2)) – sqrt((1+0.5)/(1-0.5)) tanh (128/2*sqrt(1-0.5^2))])))))))^12]^1/15

Input:

$$\sqrt[15]{10^3+\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)\right)^{12}}}$$

$\coth(x)$ is the hyperbolic cotangent function

$\tanh(x)$ is the hyperbolic tangent function

Result:

1.64382...

$1.64382\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Multiplying the two results and inverting the expression, we obtain:

-1/(((1/2[((0.5-1)/(0.5+1))^0.5 cot (2.5/2*(0.5^2-1)^0.5) – ((0.5+1)/(0.5-1))^0.5 tan(2.5/2*(0.5^2-1)^0.5)]))*(-0.5773502691896257645))

Input interpretation:

$$-\left(1\Big/\left(\left(\frac{1}{2}\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{2.5}{2}\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{2.5}{2}\sqrt{0.5^2-1}\right)\right)\right)\times(-0.5773502691896257645)\right)\right)$$

$\cot(x)$ is the cotangent function

Result:

1.64761...

$1.64761\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Alternative representations:

$$(-1)\Big/\left(\frac{1}{2}(-0.5773502691896257645000)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)\right)=$$

$$(-1)\Big/\left(-0.2886751345948128822500\left(\cot\left(-\frac{\pi}{2}+1.25\sqrt{-1+0.5^2}\right)\sqrt{-\frac{1.5}{0.5}}+\sqrt{-\frac{0.5}{1.5}}\left(i+\frac{2i}{-1+e^{2.5i\sqrt{-1+0.5^2}}}\right)\right)\right)$$

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)\right)\right)=$$

$$(-1)\Big/\left(-0.2886751345948128822500\left(-i\left(\coth\left((-1.25\,i)\,\sqrt{-1+0.5^2}\right)\sqrt{-\frac{0.5}{1.5}}\right)-\sqrt{-\frac{1.5}{0.5}}\left(-i+\frac{2\,i}{1+e^{2.5\,i\,\sqrt{-1+0.5^2}}}\right)\right)\right)$$

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)\right)\right)=$$

$$(-1)\Big/\left(-0.2886751345948128822500\left(\sqrt{-\frac{0.5}{1.5}}\left(i+\frac{2\,i}{-1+e^{2.5\,i\,\sqrt{-1+0.5^2}}}\right)-\sqrt{-\frac{1.5}{0.5}}\left(-i+\frac{2\,i}{1+e^{2.5\,i\,\sqrt{-1+0.5^2}}}\right)\right)\right)$$

Series representations:

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)\right)\right)=$$

$$\frac{3\,i}{i\left(2+\sum_{k=1}^{\infty}\left(1+3\,(-1)^k\right)q^{2\,k}\right)}\quad\text{for } q=0.338737$$

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\,\sqrt{0.5^2-1}\right)\right)\right)=$$

$$\frac{6\,i}{\sum_{k=-\infty}^{\infty}\left(1+3\,(-1)^k\right)e^{(2.16506\,i)\,i\,k}\;i\,\mathrm{sgn}(k)}$$

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000 0)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)\right)=$$
$$-\frac{6\,i}{\sum_{k=-\infty}^{\infty}\left(-\frac{1.08253\,i}{1.17187+k^2\,\pi^2}-3\,(-1)^k\,e^{(2.16506\,i)\,i\,k}\,i\,\mathrm{sgn}(k)\right)}$$

Integral representation:

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000 0)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)\right)=$$
$$\frac{6\,i}{\int_{\frac{\pi}{2}}^{1.08253\,i}\left(\csc^2(t)-\frac{(6.49519\,i)\sec^2\left(\frac{0\,i+(1.08253\,i)\,\pi-(2.16506\,i)\,t}{-2.16506\,i+\pi}\right)}{-2.16506\,i+\pi}\right)dt}$$

Multiple-argument formulas:

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000 0)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)\right)=$$
$$\frac{3.4641016151377545871098}{(0.288675\,i)\,(\cot(0.541266\,i)-\tan(0.541266\,i))-(1.73205\,i)\tan(1.08253\,i)}$$

$$(-1)\Big/\left(\frac{1}{2}\,(-0.5773502691896257645000 0)\left(\sqrt{\frac{0.5-1}{0.5+1}}\,\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\,\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)\right)=$$
$$\frac{3.4641016151377545871098}{(0.57735\,i)\cot(1.08253\,i)+\frac{(3.4641\,i)\tan(0.541266\,i)}{-1+\tan^2(0.541266\,i)}}$$

$$(-1)\Big/\left(\frac{1}{2}(-0.5773502691896257645000)\left(\sqrt{\frac{0.5-1}{0.5+1}}\cot\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)-\sqrt{\frac{0.5+1}{0.5-1}}\tan\left(\frac{1}{2}\times 2.5\sqrt{0.5^2-1}\right)\right)\right)=\frac{3.4641016151377545871098}{(0.288675\,i)\cot(0.541266\,i)+\tan(0.541266\,i)\left(-0.288675\,i+\frac{3.4641\,i}{-1+\tan^2(0.541266\,i)}\right)}$$

For the previous expression, i.e.:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)\right)^{12}}$$

729.000...

from the formula of coefficients of the '5th order' mock theta function psi_0(q) (A053260 OEIS Sequence) , for n = 167 , we obtain the following mathematical connection:

exp(Pi*sqrt(167/15)) / (2*5^(1/4)*sqrt(golden ratio*167))+Pi

Input:

$$\frac{\exp\left(\pi\sqrt{\frac{167}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{\phi\times 167}}+\pi$$

ϕ is the golden ratio

Exact result:

$$\frac{e^{\sqrt{167/15}\,\pi}}{2\sqrt[4]{5}\,\sqrt{167\,\phi}}+\pi$$

Decimal approximation:

728.98389680120810858543199436296735096952274069738772104 45...

728.983896… ≈ 729 as above

Alternate forms:

$$\frac{e^{\sqrt{167/15}\,\pi}}{\sqrt{334\left(5+\sqrt{5}\right)}}+\pi$$

$$\frac{e^{\sqrt{167/15}\,\pi}}{\sqrt[4]{5}\,\sqrt{334\left(1+\sqrt{5}\right)}}+\pi$$

$$\frac{1}{2}\sqrt{\frac{5-\sqrt{5}}{1670}}\;e^{\sqrt{167/15}\,\pi}+\pi$$

Series representations:

$$\frac{\exp\left(\pi\sqrt{\frac{167}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{\phi\,167}}+\pi=\frac{5^{3/4}\exp\left(\pi\sqrt{\frac{152}{15}}\;\sum_{k=0}^{\infty}\left(\frac{152}{15}\right)^{-k}\binom{\frac{1}{2}}{k}\right)+10\,\pi\sqrt{-1+167\,\phi}\;\sum_{k=0}^{\infty}(-1+167\,\phi)^{-k}\binom{\frac{1}{2}}{k}}{10\sqrt{-1+167\,\phi}\;\sum_{k=0}^{\infty}(-1+167\,\phi)^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{167}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{\phi\,167}}+\pi=\frac{5^{3/4}\exp\left(\pi\sqrt{\frac{152}{15}}\;\sum_{k=0}^{\infty}\frac{\left(-\frac{15}{152}\right)^{k}\left(-\frac{1}{2}\right)_k}{k!}\right)+10\,\pi\sqrt{-1+167\,\phi}\;\sum_{k=0}^{\infty}\frac{(-1)^k(-1+167\,\phi)^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{10\sqrt{-1+167\,\phi}\;\sum_{k=0}^{\infty}\frac{(-1)^k(-1+167\,\phi)^{-k}\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{\exp\left(\pi\sqrt{\frac{167}{15}}\right)}{2\sqrt[4]{5}\,\sqrt{\phi\,167}}+\pi=$$

$$\frac{5^{3/4}\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{167}{15}-z_0\right)^k z_0^{-k}}{k!}\right)+10\,\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(167\phi-z_0)^k z_0^{-k}}{k!}}{10\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(167\phi-z_0)^k z_0^{-k}}{k!}}$$

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

Thence:

We have:

$$\frac{1}{\left(\frac{1}{2}\left(\sqrt{\frac{1-0.5}{1+0.5}}\coth\left(\frac{128}{2}\sqrt{1-0.5^2}\right)-\sqrt{\frac{1+0.5}{1-0.5}}\tanh\left(\frac{128}{2}\sqrt{1-0.5^2}\right)\right)\right)^{12}}$$

$= 729.000\ldots$

$$\frac{e^{\sqrt{167/15}\,\pi}}{2\sqrt[4]{5}\,\sqrt{167\,\phi}}+\pi$$

$= 728.98389680120810858543199436296735096952274069738772104 45\ldots$

From

In particular, for the LM attractor

$$\eta=-\frac{\sqrt{6(1-\gamma^2)}}{M(1-3\gamma^2)}\exp\left(-\tau\frac{1-3\gamma^2}{3\sqrt{1-\gamma^2}}-\gamma\,\varphi_0\right),\qquad(2.26)$$

for $\gamma = 0.5$ and $\tau = 128$, $\phi_0 = -4$; M = 2.435e+18

we obtain:

-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((-128*(1-3*0.5^2))/(3(1-0.5^2)^0.5)-0.5*(-4)

Input interpretation:

$$-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}\exp\left(\frac{-128\left(1-3\times 0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)$$

Result:

$-1.15249\ldots\times 10^{-22}$

$-1.15249*10^{-22} = \eta$

From which:

(-1/2-1197.449)1/10^4*[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]

Where 1197.449 is the rest mass of Sigma baryon

Input interpretation:

$$\left(-\frac{1}{2}-1197.449\right)\times\frac{1}{10^4}\left(-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}\exp\left(\frac{-128\left(1-3\times 0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)\right)$$

Result:

$1.38062\ldots\times 10^{-23}$

$1.38062\ldots*10^{-23}$ result practically equal to the value of Planck entropy 1.380649×10^{-23} J/K

or:

(-1/2-1.6591^14)1/10^4*[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]

With regard 1.6591^{14} , where 1.6591 is a golden number very near to the value of 14th root of following Ramanujan's class invariant $Q = \left(G_{505}/G_{101/5}\right)^3 = 1164.2696$ i.e. 1.65578...

(-1/2-1.6591^14)1/10^4*[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]

Input interpretation:

$$\left(-\frac{1}{2}-1.6591^{14}\right)\times\frac{1}{10^4}\left(-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\exp\left(\frac{-128\left(1-3\times0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)\right)$$

Result:

$1.38049\ldots\times10^{-23}$

1.38049…*10^{-23} as above

And again:

(golden ratio)^2* -ln-[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]+7

Input interpretation:

$$\phi^2\times(-1)\log\left(-\left(-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\exp\left(\frac{-128\left(1-3\times0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)\right)\right)+7$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

139.250…

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

(golden ratio)^2* -ln-[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]-7

Input interpretation:

$$\phi^2\times(-1)\log\left(-\left(-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\exp\left(\frac{-128\left(1-3\times0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)\right)\right)-7$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

125.250…

125.250… result very near to the Higgs boson mass 125.18 GeV

From which:

27*1/2(((golden ratio)^2* -ln-[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]-4))-Pi

Input interpretation:

$$27\times\frac{1}{2}\left(\phi^2\times(-1)\log\left(-\left(-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\exp\left(\frac{-128\left(1-3\times0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)\right)\right)-4\right)-\pi$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

1728.23…

1728.23…

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

[27*1/2(((golden ratio)^2* -ln-[-sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2)) exp((((-128*(1-3*0.5^2)))/(3(1-0.5^2)^0.5)-0.5*(-4)))]-4))-Pi]^1/15

Input interpretation:

$$\left(27\times\frac{1}{2}\left(\phi^2\times(-1)\log\left(-\left(-\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\exp\left(\frac{-128\left(1-3\times0.5^2\right)}{3\sqrt{1-0.5^2}}-0.5\times(-4)\right)\right)\right)-4\right)-\pi\right)\wedge(1/15)$$

$\log(x)$ is the natural logarithm

ϕ is the golden ratio

Result:

1.643767...

$1.643767\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Now, from

$$ds^2 = \left(\frac{\sqrt{6(1-\gamma^2)}}{M(1-3\gamma^2)}\, e^{-\gamma\varphi_0}\right)^{\frac{2}{1-3\gamma^2}} (-\eta)^{-\frac{2}{1-3\gamma^2}} \left(-d\eta^2 + d\mathbf{x}\cdot d\mathbf{x}\right) \quad (2.27)$$

we obtain:

((((sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2))*exp(-0.5*-4)))))^(2/(1-3*0.5^2)) * (1.15249*10^-22)^-(2/(1-3*0.5^2)) * (((-d*(-1.15249*10^-22)^2)+(d^2x^2)))

Input interpretation:

$$\left(\frac{\sqrt{6\,(1-0.5^2)}}{2.435\times 10^{18}\,(1-3\times 0.5^2)}\,\exp(-0.5\times(-4))\right)^{2/(1-3\times 0.5^2)} (1.15249\times 10^{-22})^{-2/(1-3\times 0.5^2)}\left(-d\,(-1.15249\times 10^{-22})^2 + d^2\,x^2\right)$$

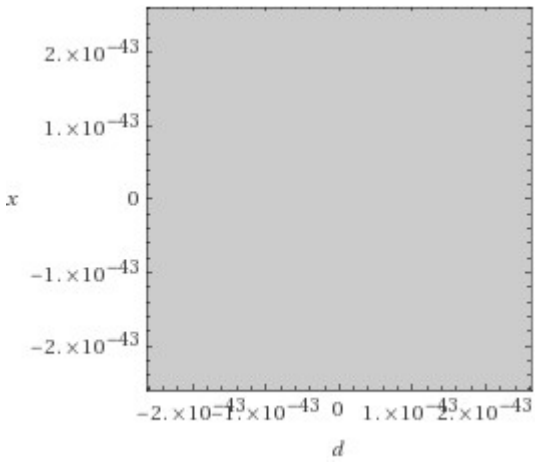
Result:

$6.20801\times 10^{42}\,(d^2\,x^2 - 1.32823\times 10^{-44}\,d)$

$6.20801*10^{42}$ *(1-1.32823*10^{-44})

$6.208009999\ldots \times 10^{42}$

Contour plot:



Alternate forms:

$$6.20801\times10^{42}\,d^2\,x^2 - 0.0824569\,d$$

$$0.0824569\,d\,(7.5288\times10^{43}\,d\,x^2 - 1)$$

$$d\,(6.20801\times10^{42}\,d\,x^2 - 0.0824569)$$

Roots:

$$d \neq 0\,, \quad x \approx -\frac{1.15249\times10^{-22}}{\sqrt{d}}$$

$$d \neq 0\,, \quad x \approx \frac{1.15249\times10^{-22}}{\sqrt{d}}$$

Root:

$$d = 0$$

Polynomial discriminant:

$$\Delta_x = 2.04757\times10^{42}\,d^3$$

Properties as a real function:

Domain

$\mathbb{R}$ (all real numbers)

Range

$$\{y \in \mathbb{R} :$$
$$16\,491\,379\,008\,631\,488\,499\,129\,377\,d + 200\,000\,000\,000\,000\,000\,000\,000\,000\,y = 0$$
$$\text{or } (d \neq 0 \text{ and } 16\,491\,379\,008\,631\,488\,499\,129\,377\,d + 200\,000\,000\,000\,000\,000\,000\,000\,000\,y > 0)\}$$

Parity

even

$\mathbb{R}$ is the set of real numbers

Derivative:

$$\frac{\partial}{\partial x}(6\,208\,013\,399\,826\,884\,781\,872\,993\,257\,872\,480\,391\,921\,664 \left(d^2\,x^2 - 1.32823\times10^{-44}\,d\right)) =$$
$$12\,416\,026\,799\,653\,769\,563\,745\,986\,515\,744\,960\,783\,843\,328\,d^2\,x$$

Indefinite integral:

$$\int\left(\frac{\sqrt{6\left(1-0.5^2\right)}\,\exp(-0.5\,(-4))}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\right)^{2/\left(1-3\times0.5^2\right)} \left(1.15249\times10^{-22}\right)^{-2/\left(1-3\times0.5^2\right)}\left(-d\left(-1.15249\times10^{-22}\right)^2 + d^2\,x^2\right)dx =$$
$$d\left(2.06934\times10^{42}\,d\,x^3 - 0.0824569\,x\right) + \text{constant}$$

Global minimum:

$$\min\{6.20801\times10^{42}\left(d^2\,x^2 - 1.32823\times10^{-44}\,d\right)\} = -\frac{1\,552\,003\,349\,956\,721\,195\,468\,248\,314\,468\,120\,097\,980\,416\,d}{18\,821\,996\,015\,547\,417\,976\,647\,009\,071\,975\,711\,443\,506\,933} \text{ at } x = 0$$

Definite integral over a disk of radius R:

$$\iint_{d^2+x^2<R^2} 6.20801\times10^{42}\left(d^2\,x^2 - 1.32823\times10^{-44}\,d\right)dd\,dx = 8.12627\times10^{41}\,R^6 + 0$$

Definite integral over a square of edge length 2 L:

$$\int_{-L}^{L}\int_{-L}^{L} 6.20801\times10^{42}\left(-1.32823\times10^{-44}\,d + d^2\,x^2\right)dx\,dd = 2.75912\times10^{42}\,L^6 + 0$$

Or:

((((sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2))*exp(-0.5*-4)))))^(2/(1-3*0.5^2)) * (1.15249*10^-22)^-(2/(1-3*0.5^2)) * (((-partial derivative(-1.15249*10^-22)^2)+(d^2x^2)))

Input interpretation:

$$\left(\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}\exp(-0.5\times(-4))\right)^{2/\left(1-3\times 0.5^2\right)}$$
$$\left(1.15249\times 10^{-22}\right)^{-2/\left(1-3\times 0.5^2\right)}\left(-\frac{\partial\left(-1.15249\times 10^{-22}\right)^2}{\partial x}+d^2\,x^2\right)$$

Result:

$6.20801\times 10^{42}\,d^2\,x^2$

$6.20801*10^{42}$

Alternate form assuming d and x are real:

$6.20801\times 10^{42}\,d^2\,x^2+0$

Roots:

$d=0$

$x=0$

Polynomial discriminant:

$\Delta=0$

Properties as a real function:

Domain

$\mathbb{R}$ (all real numbers)

Range

$\{y\in\mathbb{R}: y=0 \text{ or } (d\neq 0 \text{ and } y>0)\}$

Parity

even

$\mathbb{R}$ is the set of real numbers

Root for the variable x:

$$x = 0$$

Derivative:

$$\frac{\partial}{\partial x}(6\,208\,013\,399\,826\,884\,781\,872\,993\,257\,872\,480\,391\,921\,664\,d^2\,x^2) = 12\,416\,026\,799\,653\,769\,563\,745\,986\,515\,744\,960\,783\,843\,328\,d^2\,x$$

Indefinite integral:

$$\int\left(\frac{\sqrt{6\left(1-0.5^2\right)}\,\exp(-0.5\,(-4))}{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}\right)^{2/\left(1-3\times 0.5^2\right)}\left(1.15249\times 10^{-22}\right)^{-2/\left(1-3\times 0.5^2\right)}\left(-\frac{\partial\left(-1.15249\times 10^{-22}\right)^2}{\partial x}+d^2\,x^2\right)dx = 2.06934\times 10^{42}\,d^2\,x^3 + \text{constant}$$

Global minimum:

$$\min\left\{6.20801\times 10^{42}\,d^2\,x^2\right\} = 0 \text{ at } x = 0$$

Definite integral over a disk of radius R:

$$\iint_{d^2+x^2<R^2} 6.20801\times 10^{42}\,d^2\,x^2\,dd\,dx = 8.12627\times 10^{41}\,R^6$$

Definite integral over a square of edge length 2 L:

$$\int_{-L}^{L}\int_{-L}^{L} 6.20801\times 10^{42}\,d^2\,x^2\,dx\,dd = 2.75912\times 10^{42}\,L^6$$

Definite integral over the region where the integrand is negative:

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\theta\left(-6.20801\times 10^{42}\,d^2\,x^2\right)dx\,dd = 0$$

$\theta(x)$ is the Heaviside step function

From which:

1.5236((((sqrt(6(1-0.5^2))/((2.435e+18)(1-3*0.5^2))*exp(-0.5*-4)))))^(2/(1-3*0.5^2)) * (1.15249*10^-22)^-(2/(1-3*0.5^2)) * (((-partial derivative(-1.15249*10^-22)^2)+(d^2x^2)))

Where 1.5236 is a fractal Hausdorff dimension, that is the result of the following formula:

$$\log_2\left(\frac{1+\sqrt[3]{73-6\sqrt{87}}+\sqrt[3]{73+6\sqrt{87}}}{3}\right)$$

Input interpretation:

$$1.5236\left(\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}\exp(-0.5\times(-4))\right)^{2/(1-3\times 0.5^2)}$$
$$\left(1.15249\times 10^{-22}\right)^{-2/(1-3\times 0.5^2)}\left(-\frac{\partial\left(-1.15249\times 10^{-22}\right)^2}{\partial x}+d^2\,x^2\right)$$

Result:

$9.45853\times 10^{42}\,d^2\,x^2$

$9.45853*10^{42}$

(derivative x derivative x) * 9.45853×10^42

Input interpretation:

$\left(x'(x)\,x'(x)\right)\times 9.45853\times 10^{42}$

Result:

9 458 530 000 000 000 000 000 000 000 000 000 000 000 000 000

Scientific notation:

9.45853×10^{42}

$9.45853*10^{42}$

Or:

(differential x differential x) * 9.45853×10^42

Input interpretation:

$(x'(x)\,x'(x)) \times 9.45853 \times 10^{42}$

Result:

9 458 530 000 000 000 000 000 000 000 000 000 000 000 000 000

Scientific notation:

9.45853×10^{42}

$9.45853*10^{42}$ result very near to the value of the Planck force (or Surface Gravity)

9.630908×10^{42} N

Geometric figure:

parabola

Alternate form assuming d and x are real:

$9.45853 \times 10^{42}\, d^2\, x^2 + 0$

Roots:

$d = 0$

$x = 0$

Polynomial discriminant:

$\Delta = 0$

Properties as a real function:

Domain

$\mathbb{R}$ (all real numbers)

Range

$\{y \in \mathbb{R} : y = 0 \text{ or } (d \neq 0 \text{ and } y > 0)\}$

Parity

even

$\mathbb{R}$ is the set of real numbers

Root for the variable x:

$x = 0$

Derivative:

$$\frac{\partial}{\partial x}(9\,458\,529\,215\,976\,241\,914\,124\,276\,793\,338\,520\,963\,907\,584\,d^2\,x^2) = 18\,917\,058\,431\,952\,483\,828\,248\,553\,586\,677\,041\,927\,815\,168\,d^2\,x$$

Indefinite integral:

$$\int 1.5236\left(\frac{\sqrt{6\,(1-0.5^2)}\,\exp(-0.5\,(-4))}{2.435\times 10^{18}\,(1-3\times 0.5^2)}\right)^{2/(1-3\times 0.5^2)}(1.15249\times 10^{-22})^{-2/(1-3\times 0.5^2)}\left(-\frac{\partial(-1.15249\times 10^{-22})^2}{\partial x}+d^2\,x^2\right)dx = 3.15284\times 10^{42}\,d^2\,x^3 + \text{constant}$$

Global minimum:

$$\min\{9.45853\times 10^{42}\,d^2\,x^2\} = 0 \text{ at } x = 0$$

Definite integral over a disk of radius R:

$$\iint_{d^2+x^2<R^2} 9.45853\times 10^{42}\,d^2\,x^2\,dd\,dx = 1.23812\times 10^{42}\,R^6$$

Definite integral over a square of edge length 2 L:

$$\int_{-L}^{L}\int_{-L}^{L} 9.45853\times 10^{42}\,d^2\,x^2\,dx\,dd = 4.20379\times 10^{42}\,L^6$$

Definite integral over the region where the integrand is negative:

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\theta(-9.45853\times 10^{42}\,d^2\,x^2)\,dx\,dd = 0$$

$\theta(x)$ is the Heaviside step function

We note also that:

18*ln(9.45853×10^42)

Input interpretation:

$18 \log(9.45853 \times 10^{42})$

$\log(x)$ is the natural logarithm

Result:

1781.1988...

1781.1988… result in the range of the hypothetical mass of Gluino (gluino = 1785.16 GeV).

And that:

[18*ln(9.45853×10^42)]^1/15

Input interpretation:

$\sqrt[15]{18 \log(9.45853 \times 10^{42})}$

$\log(x)$ is the natural logarithm

Result:

1.64707798...

1.64707798…. $\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ...

Now, we have:

$$\varphi = \frac{\varphi_0}{1 - 3\gamma^2} + \frac{3\gamma}{1 - 3\gamma^2} \log\left[\frac{M(1 - 3\gamma^2)}{\sqrt{6(1 - \gamma^2)}}(-\eta)\right] \quad (2.27)$$

For M = 2.435e+18 ; γ = 0.5 ; -1.15249*10^{-22} = η ; $\varphi_0 = -4$, we obtain:

-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/((((6(1-0.5^2))))^0.5 (1.15249e-22)]

Input interpretation:

$$-\frac{4}{1-3\times0.5^2}+\frac{3\times0.5}{1-3\times0.5^2}\log\left(\frac{2.435\times10^{18}\left(1-3\times0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times1.15249\times10^{-22}\right)$$

$\log(x)$ is the natural logarithm

Result:

−77.9008…

-77.9008…

From the previous expression

$$\left(\frac{\sqrt{6\left(1-0.5^2\right)}}{2.435\times10^{18}\left(1-3\times0.5^2\right)}\exp(-0.5\times(-4))\right)^{2/(1-3\times0.5^2)}$$
$$(1.15249\times10^{-22})^{-2/(1-3\times0.5^2)}\left(-\frac{\partial(-1.15249\times10^{-22})^2}{\partial x}+d^2\,x^2\right)$$

$6.20801\times10^{42}\,d^2\,x^2$

$6.20801*10^{42}$

We obtain, multiplying the two results:

-(6.20801×10^42) * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/((((6(1-0.5^2))))^0.5 (1.15249e-22)]]

Input interpretation:

$$-6.20801\times10^{42}\left(-\frac{4}{1-3\times0.5^2}+\frac{3\times0.5}{1-3\times0.5^2}\log\left(\frac{2.435\times10^{18}\left(1-3\times0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times1.15249\times10^{-22}\right)\right)$$

$\log(x)$ is the natural logarithm

Result:

$4.83609\ldots\times10^{44}$

$4.83609\ldots*10^{44}$

-(6.20801×10^42) * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/(((6(1-0.5^2))))^0.5 (1.15249e-22)]]

Input interpretation:

$$-6.20801\times 10^{42}\left(-\frac{4}{1-3\times 0.5^2}+\frac{3\times 0.5}{1-3\times 0.5^2}\log\left(\frac{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times 1.15249\times 10^{-22}\right)\right)$$

$\log(x)$ is the natural logarithm

Result:

$4.83609\ldots\times 10^{44}$

4.83609…*10^44

From which, we obtain:

1/4* -(6.20801×10^42) * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/(((6(1-0.5^2))))^0.5 (1.15249e-22)]]

Input interpretation:

$$\frac{1}{4}\times(-1)\times 6.20801\times 10^{42}\left(-\frac{4}{1-3\times 0.5^2}+\frac{3\times 0.5}{1-3\times 0.5^2}\log\left(\frac{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times 1.15249\times 10^{-22}\right)\right)$$

$\log(x)$ is the natural logarithm

Result:

$1.20902\ldots\times 10^{44}$

1.20902…*10^44 result very near to the value of the Planck Surface Gravity

1.210256×10^{44} kg·m/s^2

From the expression

$$-\frac{4}{1-3\times 0.5^2}+\frac{3\times 0.5}{1-3\times 0.5^2}\log\left(\frac{2.435\times 10^{18}\left(1-3\times 0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times 1.15249\times 10^{-22}\right)$$

we obtain also:

-2 * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/(((6(1-0.5^2))))^0.5 (1.15249e-22)]]-13-3

Input interpretation:

$$-2\left(-\frac{4}{1-3\times0.5^2}+\frac{3\times0.5}{1-3\times0.5^2}\log\left(\frac{2.435\times10^{18}\left(1-3\times0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times1.15249\times10^{-22}\right)\right)-$$
$$13-3$$

$\log(x)$ is the natural logarithm

Result:

139.802...

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

-2 * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/((((6(1-0.5^2))))^0.5 (1.15249e-22)]]-21-8-1

Input interpretation:

$$-2\left(-\frac{4}{1-3\times0.5^2}+\frac{3\times0.5}{1-3\times0.5^2}\log\left(\frac{2.435\times10^{18}\left(1-3\times0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times1.15249\times10^{-22}\right)\right)-$$
$$21-8-1$$

$\log(x)$ is the natural logarithm

Result:

125.802...

125.802… result very near to the Higgs boson mass 125.18 GeV

27*1/2(((-2 * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/((((6(1-0.5^2))))^0.5 (1.15249e-22)]]-21-5-2)))+3

Input interpretation:

$$27\times\frac{1}{2}\left(-2\left(-\frac{4}{1-3\times0.5^2}+\frac{3\times0.5}{1-3\times0.5^2}\log\left(\frac{2.435\times10^{18}\left(1-3\times0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times1.15249\times10^{-22}\right)\right)-21-5-2\right)+3$$

$\log(x)$ is the natural logarithm

Result:

1728.32...

1728.32…

This result is very near to the mass of candidate glueball **$f_0(1710)$ scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

((((27*1/2(((-2 * [-4/(1-3*0.5^2)+(3*0.5)/(1-3*0.5^2) ln [(((2.435e+18)(1-3*0.5^2)))/((((6(1-0.5^2))))^0.5 (1.15249e-22)]]-21-5-2)))+3))))^1/15

Input interpretation:

$$\left(27\times\frac{1}{2}\left(-2\left(-\frac{4}{1-3\times0.5^2}+\frac{3\times0.5}{1-3\times0.5^2}\log\left(\frac{2.435\times10^{18}\left(1-3\times0.5^2\right)}{\sqrt{6\left(1-0.5^2\right)}}\times 1.15249\times10^{-22}\right)\right)-21-5-2\right)+3\right)\text{^}(1/15)$$

$\log(x)$ is the natural logarithm

Result:

1.64377...

$1.64377\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Now, we have that:

$$\frac{W_S}{W_I} \approx 1 - 18\frac{(1-\gamma^2)^4}{(2-3\gamma^2)}\left(\frac{d\varphi}{d\tau}+\frac{\gamma}{\sqrt{1-\gamma^2}}\right)^2, \qquad (6.16)$$

1-18*(1-(1/sqrt5)^2)^4/(2-3*(1/sqrt5)^2) * [(derivative(-4)/(128))+((1/sqrt5)/(((1-(1/sqrt5)^2))^0.5))]

Input interpretation:

$$1-18\times\frac{\left(1-\left(\frac{1}{\sqrt{5}}\right)^2\right)^4}{2-3\left(\frac{1}{\sqrt{5}}\right)^2}\left(\frac{\partial}{\partial x}\left(-\frac{4}{128}\right)+\frac{\frac{1}{\sqrt{5}}}{\sqrt{1-\left(\frac{1}{\sqrt{5}}\right)^2}}\right)$$

Exact result:

$$-\frac{1429}{875}$$

Decimal approximation:

−1.633142857142857142857142857142857142857142857142857142857142857...

Repeating decimal:

$-1.6331\overline{42857}$ (period 6)

-1.633142857

From which:

(((-(1-18*(1-(1/sqrt5)^2)^4/(2-3*(1/sqrt5)^2) * [(derivative(-4)/(128))+((1/sqrt5)/(((1-(1/sqrt5)^2))^0.5))]))))+11/10^3

Input interpretation:

$$-\left(1-18\times\frac{\left(1-\left(\frac{1}{\sqrt{5}}\right)^2\right)^4}{2-3\left(\frac{1}{\sqrt{5}}\right)^2}\left(\frac{\partial}{\partial x}\left(-\frac{4}{128}\right)+\frac{\frac{1}{\sqrt{5}}}{\sqrt{1-\left(\frac{1}{\sqrt{5}}\right)^2}}\right)\right)+\frac{11}{10^3}$$

Exact result:

$$\frac{11509}{7000}$$

Decimal approximation:

1.644142857142857142857142857142857142857142857142857142857142857...

Repeating decimal:

$1.644\overline{142857}$ (period 6)

$1.644142857 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 \ldots$

Observations

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

Furthermore, we obtain as results of our computations, always values very near to the Higgs boson mass 125.18 GeV and practically equals to the rest mass of Pion meson 139.57 MeV. In conclusion we obtain also many results that are very good approximations to the value of the golden ratio 1.618033988749... and to ζ(2) = $\frac{\pi^2}{6} = 1.644934 \ldots$

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.

From:

Modular equations and approximations to π - *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

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

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

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, 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 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:

$$1.627201622607250929294215673911797954183858113695401 6\ldots \times 10^{-6}$$

$1.6272016\ldots * 10^{-6}$

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:

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

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

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

Now:

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

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

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

$$=0.00666501785\ldots$$

From:

ln(0.00666501784619)

Input interpretation:

$\log(0.00666501784619)$

Result:

−5.010882647757...

-5.010882647757…

Alternative representations:

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

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

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

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:

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

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

References

CMB Imprints of a Pre-Inflationary Climbing Phase - E. Dudas, N. Kitazawa, S. P. Patil and A. Sagnotti - arXiv:1202.6630v2 [hep-th] 9 May 2012

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

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