On Ramanujan's mathematics applied to various sectors of Particle Physics and Cosmological parameters (dilaton and inflaton values): further possible new mathematical connections

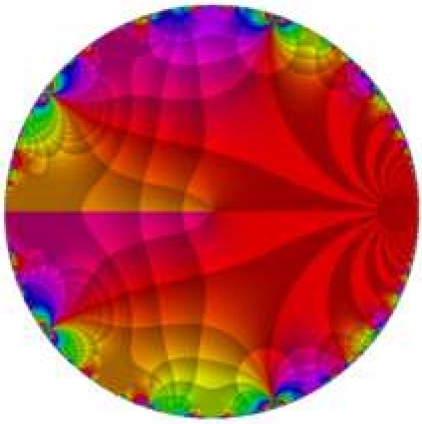
Michele Nardelli[1], Antonio Nardelli

Abstract

In this research thesis, we have analyzed further Ramanujan equations and described the new possible mathematical connections with various sectors of Particle Physics and Cosmological parameters (dilaton and inflaton values).

[1] M.Nardelli have studied by 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

https://twitter.com/royalsociety/status/1076386910845710337



From Wikipedia
Plot of a Rogers–Ramanujan continued fraction.

From:

STRING THEORY VOLUME II - Superstring Theory and Beyond
JOSEPH POLCHINSKI
Institute for Theoretical Physics - University of California at Santa Barbara

We will consider the problem of stabilizing the dilaton shortly, but for now let us see what happens if we assume that some higher correction, additional gauge group, or other modification gives rise to a stable supersymmetry-breaking vacuum at a point where S has roughly the value $8\pi^2/g_{\mathrm{YM}}^2 \approx 100$ found in simple grand unified models. The number 100 seems large, but noting that $|b_8| = 90$ this is actually the typical scale for the S-dependence.

Having broken supersymmetry, the next question is how this affects the masses of the ordinary quarks, leptons, gauge bosons, and their superpartners. The only tree-level coupling of the supersymmetry breaking field S to these fields is again through a gauge kinetic term, that of the Standard Model gauge fields. Thus F_S has a coupling of the same form as (18.8.5) but to the ordinary gauginos. Inserting the expectation value for F_S gives

a gaugino mass term,

$$\kappa\langle F_S\rangle\bar{\lambda}\lambda \approx \kappa^2 m_{\mathrm{SU}}^3 \exp(-3\langle S\rangle/|b_8|)\bar{\lambda}\lambda \ . \tag{18.8.10}$$

The mass is

$$m_\lambda \approx \kappa^2 m_{\mathrm{SU}}^3 \exp(-3\langle S\rangle/|b_8|) \approx \exp(-3\langle S\rangle/|b_8|) \times 10^{18} \text{ GeV} \ . \tag{18.8.11}$$

To solve the Higgs naturalness problem the masses of the Standard Model superpartners must be of order 10^3 GeV or less. For the values $S \approx 100$ and $|b_8| = 90$ of this simple model this is not the case, but because these parameters appear in the exponent a modest ratio of parameters $S/|b| \approx 12$ would produce the observed large ratio of mass scales.

If $S = 108$ and $|b_8| = 90$, we have: $108/90 = 1.2$

Thence:

exp((-3*(1.2))) * 10^18 GeV

Input interpretation:

$\exp(-3 \times 1.2) \times 10^{18}$ GeV (gigaelectronvolts)

Result:

2.732×10^{16} GeV (gigaelectronvolts)

$2.732 * 10^{16}$

Unit conversions:

2.732×10^{25} eV (electronvolts)

4.378 MJ (megajoules)

4.378×10^{6} J (joules)

4.378×10^{13} ergs
(unit officially deprecated)

1.216 kW h (kilowatt hours)

Comparisons as energy:

≈ (0.25 ≈ 1/4) ×
average electrical energy required by a Samsung S3 per year (≈ 1.8×10^{7} J)

≈ 0.35 ×
average electrical energy required by an Apple iPhone 5 per year (≈ 1.3×10^{7} J)

≈ energy released by explosion of one kilogram of TNT (1 kilogram of TNT)

Comparison as kinetic energy:

≈ 13 × typical kinetic energy of a car at highway speeds (200000 to 900000 J)

Interpretations:

energy

kinetic energy

Basic unit dimensions:

$[\text{mass}]\,[\text{length}]^2\,[\text{time}]^{-2}$

Corresponding quantities:

Relativistic mass m from $E = mc^2$:

49 ng (nanograms)

Spectroscopic wavenumber $\tilde{\nu}$ from $\tilde{\nu} = E/(hc)$:

2.204×10^{31} m^{-1} (reciprocal meters)

From:

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

Regular Article - Theoretical Physics
Generalized dilaton–axion models of inflation, de Sitter vacua and spontaneous SUSY breaking in supergravity
Yermek Aldabergenov, Auttakit Chatrabhuti, Sergei V. Ketov

Table 2 The masses of inflaton, axion and gravitino, and the VEVs of F- and D-fields derived from our models by fixing the amplitude A_s according to PLANCK data – see Eq. (57). The value of $\langle F_T \rangle$ for a positive ω_1 is not fixed by A_s

α	3	4		5		6		7	
sgn(ω_1)	$-$	+	$-$	+	$-$	+	$-$	$-$	
m_φ	2.83	2.95	2.73	2.71	2.71	2.53	2.58	1.86	$\times 10^{13}$ GeV
$m_{\psi'}$	0	0.93	1.73	2.02	2.02	4.97	2.01	1.56	$\times 10^{13}$ GeV
$m_{3/2}$	≥ 1.41	2.80	0.86	2.56	0.64	3.91	0.49	0.29	$\times 10^{13}$ GeV
$\langle F_T \rangle$	any	$\neq 0$	0	$\neq 0$	0	$\neq 0$	0	0	$\times 10^{31}$ GeV^2
$\langle D \rangle$	8.31	4.48	5.08	3.76	3.76	3.25	2.87	1.73	$\times 10^{31}$ GeV^2

$m_\varphi = 2.53 - 2.83 \times 10^{13}$GeV

We calculate, from the previous formula exp((-3*(1.2))) * 10^18 GeV = 2.732 * 10^{16}:

(1/3*2.732×10^16 gigaelectronvolts)^2

Input interpretation:

$\left(\frac{1}{3} \times 2.732 \times 10^{16} \text{ GeV (gigaelectronvolts)}\right)^2$

Result:

8.293×10^{31} GeV^2 (gigaelectronvolts squared)

8.293 * 10^{31} GeV^2

This result is very near to the value of $\langle D \rangle$ in the Table that is 8.31 * 10^{31} GeV^2

Unit conversions:

8.293×10^{49} eV^2 (electronvolts squared)

2.129×10^{12} J^2 (joules squared)

Interpretations:

quadratic Casimir operator of the Poincaré group

Basic unit dimensions:

$[\text{mass}]^2 [\text{length}]^4 [\text{time}]^{-4}$

And:

1/((((1/3*2.732×10^16)^2)))

Input interpretation:

$$\frac{1}{\left(\frac{1}{3}\times 2.732\times 10^{16}\right)^2}$$

Result:

$1.2058162143158788310120924609154771066413141574613763... \times 10^{-32}$

$1.2058162143....*10^{-32}$

From which:

((((1/((((1/3*2.732×10^16)^2)))))))^1/4096

Input interpretation:

$$\sqrt[4096]{\frac{1}{\left(\frac{1}{3}\times 2.732\times 10^{16}\right)^2}}$$

Result:

0.98221676815368921579...

0.98221676815….. result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243 = \phi}$

Furthermore:

(1/(1019.461)*2.732×10^16 gigaelectronvolts)

Where 1019.461 is the rest mass of Phi meson that is about 10^3

Input interpretation:

$\frac{1}{1019.461} \times 2.732 \times 10^{16}$ GeV (gigaelectronvolts)

Result:

2.68×10^{13} GeV (gigaelectronvolts)

$2.68*10^{13}$ GeV

Unit conversions:

2.68×10^{22} eV (electronvolts)

4.294 kJ (kilojoules)

4294 J (joules)

4.294×10^{10} ergs
(unit officially deprecated)

1.193 W h (watt hours)

Interpretations:

energy

kinetic energy

Basic unit dimensions:

$[\text{mass}][\text{length}]^2[\text{time}]^{-2}$

Corresponding quantities:

Relativistic mass m from $E = mc^2$:

48 pg (picograms)

Spectroscopic wavenumber $\tilde{\nu}$ from $\tilde{\nu} = E/(hc)$:

2.161×10^{28} m^{-1} (reciprocal meters)

The result $2.68 * 10^{13}$ can be considered a gauge boson very near to the mass of the inflaton/dilaton $m_\varphi = 2.53 - 2.83 \times 10^{13}$GeV

From Wikipedia:

Gaugino

Is the hypothetical fermionic supersymmetric field quantum (superpartner) of a gauge field, as predicted by gauge theory combined with supersymmetry. All gauginos have spin 1/2, except for gravitino (spin 3/2). In the minimal supersymmetric extension of the standard model the following gauginos exist:

The gluino (symbol $\tilde{g}$) is the superpartner of the gluon, and hence carries color charge.

The gravitino (symbol $\tilde{G}$) is the supersymmetric partner of the graviton.

Three **winos** (symbol $\tilde{W}^{\pm}$and $\tilde{W}^{3}$) are the superpartners of the W bosons of the $SU(2)_L$ gauge fields.

The **bino** is the superpartner of the U(1) gauge field corresponding to weak hypercharge.

Sometimes the term "electroweakinos" is used to refer to winos and binos and on occasion also higgsinos.

From the above formula, we obtain:

1/(((1/(1019.461)*2.732×10^16)))

Input interpretation:

$$\frac{1}{\frac{1}{1019.461} \times 2.732 \times 10^{16}}$$

Result:

$3.731555636896046852122986822840409956076134699853587 1... \times 10^{-14}$

$3.731555636896...*10^{-14}$

And:

(((((1/(((1/(1019.461)*2.732×10^16))))))))^1/4096

Input interpretation:

$$\sqrt[4096]{\frac{1}{\frac{1}{1019.461} \times 2.732 \times 10^{16}}}$$

Result:

0.99247974632...

0.99247974632... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243 = \phi}$

We have also:

64(1+8)+64*colog((1/((((1/3*2.732×10^16)^2)))))

Input interpretation:

$$64(1+8)+64\left(-\log\left(\frac{1}{\left(\frac{1}{3}\times 2.732\times 10^{16}\right)^2}\right)\right)$$

$\log(x)$ is the natural logarithm

Result:

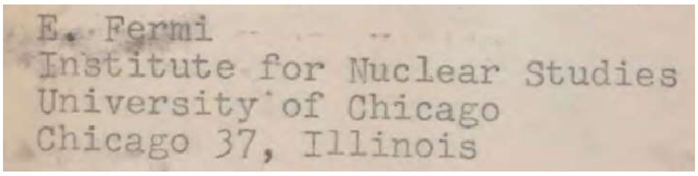
5279.716242040981105...

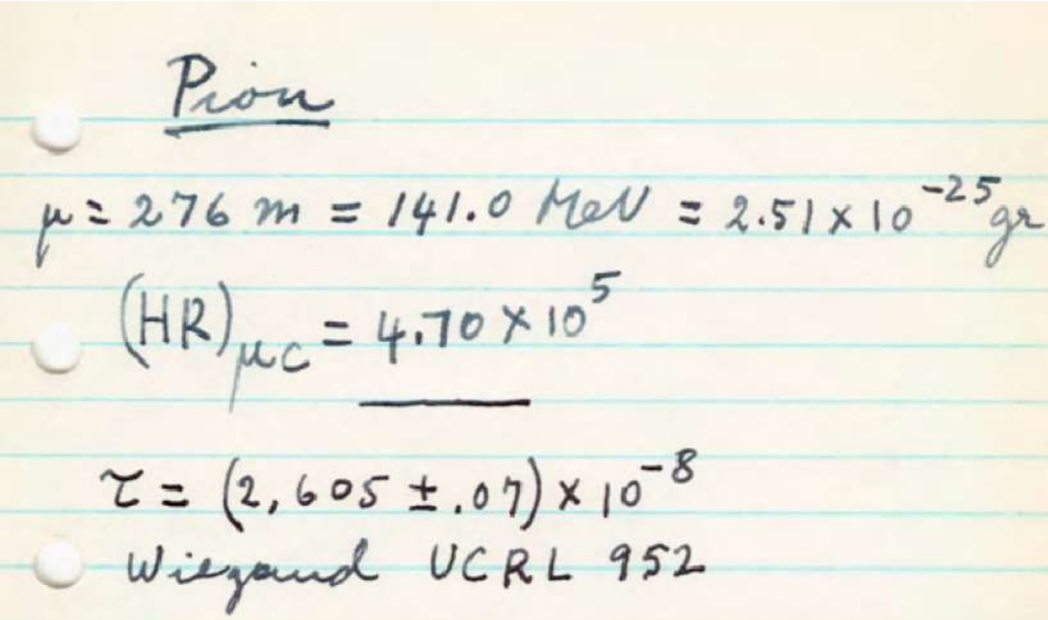
5279.716242.... result practically equal to the rest mass of B meson 5279.53

Now, we have that:

From:

Enrico Fermi notebook - 1951


E. Fermi
Institute for Nuclear Studies
University of Chicago
Chicago 37, Illinois


Pion

$\mu = 276\, m = 141.0\ MeV = 2.51 \times 10^{-25}\ gr$

$(HR)_{\mu c} = 4.70 \times 10^{5}$

$\tau = (2,605 \pm .07) \times 10^{-8}$

Wiegand UCRL 952

2.51 * 10^-25 grams = Kg

Input interpretation:

convert 2.51×10^{-25} grams to kilograms

Result:

2.51×10^{-28} kg (kilograms)

Comparisons as mass:

≈ (0.15 ≈ 1/7) × proton mass (≈ 1.7×10^{-27} kg)

≈ 1.3 × muon mass (≈ 1.9×10^{-28} kg)

Comparison as mass of atom:

≈ (0.15 ≈ 1/7) × unified atomic mass unit (1 m_u)

Comparison as mass of molecule:

≈ (0.075 ≈ 1/13) × molecular mass of hydrogen gas (≈ 2 u)

Interpretations:

mass

mass of atom

mass of molecule

Corresponding quantities:

Relativistic energy E from $E = mc^2$:

141 MeV (megaelectronvolts)

Characteristic length L from $L = h/(mc)$:

8.8 fm (femtometers)

Thermal de Broglie wavelength at 100 K from $\lambda = h/(2\pi m k T)^{1/2}$:

449 pm (picometers)

Characteristic time T from $T = h/(mc^2)$:

2.9×10^{-23} seconds

Thermodynamic temperature T from $kT = mc^2$:

1.634×10^{12} K (kelvins)

Compton frequency ν from $\nu = mc^2/h$:

3.405×10^{22} Hz (hertz)

Molar mass M from $M = m_a N_A$:

0.15 g/mol (grams per mole)

Molar mass M from $M = m N_A$:

0.15 g/mol (grams per mole)

(2.51×10^-28)^1/4096

Input interpretation:

$$\sqrt[4096]{2.51 \times 10^{-28}}$$

Result:

0.9846040982...

0.9846040982... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243 = \phi}$

And:

13+27*colog(2.51×10^-28)

Input interpretation:

$13 + 27(-\log(2.51 \times 10^{-28}))$

$\log(x)$ is the natural logarithm

Result:

1728.9067...

1728.9067...

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

And from:

$$\tau = (2{,}605 \pm .07) \times 10^{-8}$$

We obtain:

(2.605×10^-8)^1/2

Input interpretation:

$\sqrt{2.605 \times 10^{-8}}$

Result:

0.000161400...

$1.61400... \times 10^{-4}$

$1.61400...*10^{-4}$

And:

colog(2.605×10^-8)^3

Input interpretation:

$(-\log(2.605\times 10^{-8}))^3$

$\log(x)$ is the natural logarithm

Result:

5325.680...

5325.68.... result practically equal to the rest mass of B meson 5325.1

We have also:

$(HR)_{\mu c} = 4.70 \times 10^5$

((ln(4.70*10^5)))^3-123+7

Where 123 and 7 are Lucas numbers

Input interpretation:

$\log^3(4.7\times 10^5) - 123 + 7$

$\log(x)$ is the natural logarithm

Result:

2111.810...

2111.810... result very near to the rest mass of strange D meson 2112.3

64(((4.70*10^5)))^1/4-Pi

Input interpretation:

$64\sqrt[4]{4.7\times 10^5} - \pi$

Result:

1672.590...

1672.590... result practically equal to the rest mass of Omega baryon 1672.45

Now, we have that:

$$\sigma = \text{factor} \times \frac{16\pi^2}{3} \frac{R^5 \mu^{1/2} p}{c M^{3/2}} D^2(0)$$

p = mom. of pion $\quad R = 1.4 \times 10^{-13}$

((colog(1.4*10^-13)*64)) – 24

Input interpretation:

$-\log(1.4 \times 10^{-13}) \times 64 - 24$

$\log(x)$ is the natural logarithm

Result:

1870.217...

1870.217... result very near to the rest mass of D meson 1869.62

Now, we have that:

Pion production (cont.)

Deuteron production

$$\sigma_{\text{deuteron}} = \left.\begin{matrix} 3/8 \\ \text{or} \\ 6/12 \end{matrix}\right\} 2.23 \times 10^{-13}\, p_{\text{pion}}$$

colog(((((2.23×10^-13)))))*64

Input interpretation:

$-\log(2.23 \times 10^{-13}) \times 64$

$\log(x)$ is the natural logarithm

Result:

1864.423...

1864.423... result practically equal to the rest mass of D meson 1864.84

And:

((((2.23×10^-13))))^1/4096

Input interpretation:

$$\sqrt[4096]{2.23\times 10^{-13}}$$

Result:

0.9929130237...

0.9929130237... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243} = \boldsymbol{\phi}$

Now, we have that:

$$\underbrace{\frac{\pi R^5 \mu}{3\sqrt{2}\,\hbar^3 c}}_{=\,2.85\times 10^{-19}} T^2 = \sigma$$

29+4+64*colog(2.85*10^-19)

Where 29 and 4 are Lucas numbers

Input interpretation:

$29 + 4 + 64(-\log(2.85 \times 10^{-19}))$

log(x) is the natural logarithm

Result:

2765.9151...

2765.9151... result practically equal to the rest mass of charmed Omega baryon 2765.9

(199+47+2)+64*colog(2.85*10^-19)

Where 199, 47 an 2 are Lucas numbers

Input interpretation:

$(199 + 47 + 2) + 64(-\log(2.85 \times 10^{-19}))$

log(x) is the natural logarithm

Result:

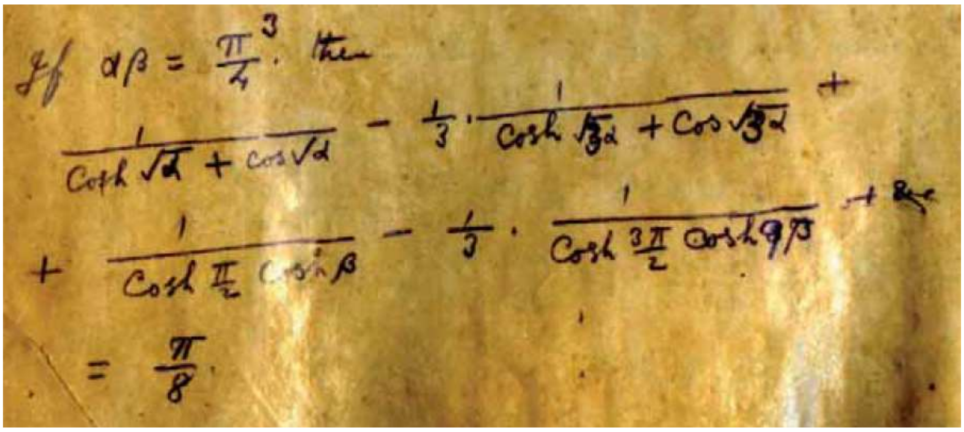
2980.9151...

2980.9151... result practically equal to the rest mass of Charmed eta meson 2980.3

From:

Manuscript Book 1 – *Srinivasa Ramanujan*

Page 87



If $\alpha\beta = \frac{\pi^3}{4}$. then

$$\frac{1}{\cosh\sqrt{\alpha}+\cos\sqrt{\alpha}} - \frac{1}{3}\cdot\frac{1}{\cosh\sqrt{3\alpha}+\cos\sqrt{3\alpha}} + \frac{1}{\cosh\frac{\pi}{2}\cosh\beta} - \frac{1}{3}\cdot\frac{1}{\cosh\frac{3\pi}{2}\cosh 9\beta} + \&c = \frac{\pi}{8}$$

1/(cosh(sqrt(Pi))+cos(sqrt(Pi)))-
1/3*1/((((cosh(sqrt(3Pi)))+(cos(sqrt(3Pi))))))+1/(cosh(Pi/2)*cosh(Pi^2/4))-
1/3*1/((((cosh((3Pi/2))(cosh(9Pi^2/4))))))

Input:

$$\frac{1}{\cosh(\sqrt{\pi}) + \cos(\sqrt{\pi})} - \frac{1}{3} \times \frac{1}{\cosh(\sqrt{3\pi}) + \cos(\sqrt{3\pi})} + \frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)} - \frac{1}{3} \times \frac{1}{\cosh\left(3 \times \frac{\pi}{2}\right)\cosh\left(9 \times \frac{\pi^2}{4}\right)}$$

$\cosh(x)$ is the hyperbolic cosine function

Exact result:

$$\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{\pi^2}{4}\right) - \frac{1}{3}\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{9\pi^2}{4}\right) + \frac{1}{\cos(\sqrt{\pi}) + \cosh(\sqrt{\pi})} - \frac{1}{3(\cos(\sqrt{3\pi}) + \cosh(\sqrt{3\pi}))}$$

$\operatorname{sech}(x)$ is the hyperbolic secant function

Decimal approximation:

0.3867814004498545449072008765787832762853178989386392476 52...

0.3867814004498…

Alternate forms:

$$\frac{2 e^{\pi/2}\operatorname{sech}\left(\frac{\pi^2}{4}\right)}{1 + e^{\pi}} - \frac{1}{3}\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{9\pi^2}{4}\right) + \frac{2}{2\cos(\sqrt{\pi}) + 2\cosh(\sqrt{\pi})} - \frac{2}{3(2\cos(\sqrt{3\pi}) + 2\cosh(\sqrt{3\pi}))}$$

$$\frac{4\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}{(1 + \cosh(\pi))\left(1 + \cosh\left(\frac{\pi^2}{2}\right)\right)} - \frac{4\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)}{3(1 + \cosh(3\pi))\left(1 + \cosh\left(\frac{9\pi^2}{2}\right)\right)} + \frac{1}{\cos(\sqrt{\pi}) + \cosh(\sqrt{\pi})} - \frac{1}{3(\cos(\sqrt{3\pi}) + \cosh(\sqrt{3\pi}))}$$

$$\frac{4}{\left(e^{-\pi/2}+e^{\pi/2}\right)\left(e^{-\pi^2/4}+e^{\pi^2/4}\right)}-\frac{4}{3\left(e^{-(3\pi)/2}+e^{(3\pi)/2}\right)\left(e^{-(9\pi^2)/4}+e^{(9\pi^2)/4}\right)}+\frac{1}{\frac{1}{2}\left(e^{-\sqrt{\pi}}+e^{\sqrt{\pi}}\right)+\frac{1}{2}\left(e^{-i\sqrt{\pi}}+e^{i\sqrt{\pi}}\right)}-\frac{1}{3\left(\frac{1}{2}\left(e^{-\sqrt{3\pi}}+e^{\sqrt{3\pi}}\right)+\frac{1}{2}\left(e^{-i\sqrt{3\pi}}+e^{i\sqrt{3\pi}}\right)\right)}$$

Alternative representations:

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\frac{1}{\cos\left(\frac{i\pi}{2}\right)\cos\left(\frac{i\pi^2}{4}\right)}-\frac{1}{3\left(\cos\left(\frac{3i\pi}{2}\right)\cos\left(\frac{9i\pi^2}{4}\right)\right)}+\frac{1}{\cosh(-i\sqrt{\pi})+\cos(i\sqrt{\pi})}-\frac{1}{3(\cosh(-i\sqrt{3\pi})+\cos(i\sqrt{3\pi}))}$$

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\frac{1}{\cos\left(-\frac{i\pi}{2}\right)\cos\left(-\frac{i\pi^2}{4}\right)}-\frac{1}{3\left(\cos\left(-\frac{3i\pi}{2}\right)\cos\left(-\frac{9i\pi^2}{4}\right)\right)}+\frac{1}{\cosh(-i\sqrt{\pi})+\cos(-i\sqrt{\pi})}-\frac{1}{3(\cosh(-i\sqrt{3\pi})+\cos(-i\sqrt{3\pi}))}$$

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\frac{1}{\cos\left(-\frac{i\pi}{2}\right)\cos\left(-\frac{i\pi^2}{4}\right)}-\frac{1}{3\left(\cos\left(-\frac{3i\pi}{2}\right)\cos\left(-\frac{9i\pi^2}{4}\right)\right)}+\frac{1}{\cosh(i\sqrt{\pi})+\cos(-i\sqrt{\pi})}-\frac{1}{3(\cosh(i\sqrt{3\pi})+\cos(-i\sqrt{3\pi}))}$$

Series representations:

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))\,3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{\pi^2}{4}\right)-\frac{1}{3}\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{9\pi^2}{4}\right)-\frac{1}{3\left(\sum_{k=0}^{\infty}\frac{(-3\pi)^k}{(2k)!}+\sqrt{\pi}\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\frac{\left(-\frac{3\pi}{4}\right)^{-s}\Gamma(s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)}+\frac{1}{\sum_{k=0}^{\infty}\frac{(-\pi)^k}{(2k)!}+\sqrt{\pi}\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\frac{\left(-\frac{\pi}{4}\right)^{-s}\Gamma(s)}{\Gamma\left(\frac{1}{2}-s\right)}}$$

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))\,3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{\pi^2}{4}\right)-\frac{1}{3}\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{9\pi^2}{4}\right)-\frac{1}{3\sqrt{\pi}\sum_{j=0}^{\infty}\left(\operatorname{Res}_{s=-j}\frac{\left(\frac{4}{3\pi}\right)^{s}\Gamma(s)}{\Gamma\left(\frac{1}{2}-s\right)}+\operatorname{Res}_{s=-j}\frac{\left(-\frac{3\pi}{4}\right)^{-s}\Gamma(s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)}+\frac{1}{\sqrt{\pi}\sum_{j=0}^{\infty}\left(\operatorname{Res}_{s=-j}\frac{\left(\frac{4}{\pi}\right)^{s}\Gamma(s)}{\Gamma\left(\frac{1}{2}-s\right)}+\operatorname{Res}_{s=-j}\frac{\left(-\frac{\pi}{4}\right)^{-s}\Gamma(s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)}$$

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))\,3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=$$

$$\left(-\sum_{k=0}^{\infty}\frac{(-\pi)^k+\pi^k}{(2k)!}+3\sum_{k=0}^{\infty}\frac{(-3\pi)^k+(3\pi)^k}{(2k)!}+3\pi^2\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\sum_{k_4=0}^{\infty}\frac{(-1)^{k_1+k_2}\left(\frac{(-\pi)^{k_3}}{(2k_3)!}+\frac{\pi^{k_3}}{(2k_3)!}\right)\left(\frac{(-3\pi)^{k_4}}{(2k_4)!}+\frac{(3\pi)^{k_4}}{(2k_4)!}\right)(1+2k_1)(1+2k_2)}{\left(\frac{\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_1\right)^2\right)\left(\frac{\pi^4}{16}+\pi^2\left(\frac{1}{2}+k_2\right)^2\right)}-\pi^2\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\sum_{k_4=0}^{\infty}\frac{(-1)^{k_1+k_2}\left(\frac{(-\pi)^{k_3}}{(2k_3)!}+\frac{\pi^{k_3}}{(2k_3)!}\right)\left(\frac{(-3\pi)^{k_4}}{(2k_4)!}+\frac{(3\pi)^{k_4}}{(2k_4)!}\right)(1+2k_1)(1+2k_2)}{\left(\frac{9\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_1\right)^2\right)\left(\frac{81\pi^4}{16}+\pi^2\left(\frac{1}{2}+k_2\right)^2\right)}\right)\Bigg/\left(3\left(\sum_{k=0}^{\infty}\frac{(-\pi)^k+\pi^k}{(2k)!}\right)\sum_{k=0}^{\infty}\frac{(-3\pi)^k+(3\pi)^k}{(2k)!}\right)$$

Integral representations:

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))\,3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\frac{4\left(\int_0^\infty \frac{t^i}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{(i\pi)/2}}{1+t^2}\,dt}{\pi^2}-\frac{4\left(\int_0^\infty \frac{t^{3i}}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{(9i\pi)/2}}{1+t^2}\,dt}{3\pi^2}+\frac{1}{-\frac{i}{2\sqrt{\pi}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{\pi/(4s)+s}}{\sqrt{s}}\,ds-\int_{\frac{\pi}{2}}^{\sqrt{\pi}}\sin(t)\,dt}-\frac{1}{3\left(-\frac{i}{2\sqrt{\pi}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{(3\pi)/(4s)+s}}{\sqrt{s}}\,ds-\int_{\frac{\pi}{2}}^{\sqrt{3\pi}}\sin(t)\,dt\right)}\quad \text{for } \gamma>0$$

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))\,3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\frac{4\left(\int_0^\infty \frac{t^i}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{(i\pi)/2}}{1+t^2}\,dt}{\pi^2}-\frac{4\left(\int_0^\infty \frac{t^{3i}}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{(9i\pi)/2}}{1+t^2}\,dt}{3\pi^2}+\frac{1}{-\frac{i}{2\sqrt{\pi}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-\pi/(4s)+s}}{\sqrt{s}}\,ds+\int_{\frac{i\pi}{2}}^{\sqrt{\pi}}\sinh(t)\,dt}-\frac{1}{3\left(-\frac{i}{2\sqrt{\pi}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-(3\pi)/(4s)+s}}{\sqrt{s}}\,ds+\int_{\frac{i\pi}{2}}^{\sqrt{3\pi}}\sinh(t)\,dt\right)}\quad \text{for } \gamma>0$$

$$\frac{1}{\cosh(\sqrt{\pi})+\cos(\sqrt{\pi})}-\frac{1}{(\cosh(\sqrt{3\pi})+\cos(\sqrt{3\pi}))\,3}+\frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}-\frac{1}{\left(\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)\right)3}=\frac{4\left(\int_0^\infty \frac{t^i}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{(i\pi)/2}}{1+t^2}\,dt}{\pi^2}-\frac{4\left(\int_0^\infty \frac{t^{3i}}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{(9i\pi)/2}}{1+t^2}\,dt}{3\pi^2}+\frac{1}{1-\frac{i}{2\sqrt{\pi}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-\pi/(4s)+s}}{\sqrt{s}}\,ds+\sqrt{\pi}\int_0^1\sinh(\sqrt{\pi}\,t)\,dt}-\frac{1}{3\left(1-\frac{i}{2\sqrt{\pi}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-(3\pi)/(4s)+s}}{\sqrt{s}}\,ds+\sqrt{3\pi}\int_0^1\sinh(\sqrt{3\pi}\,t)\,dt\right)}\quad \text{for } \gamma>0$$

And:

Pi/8

Input:

$$\frac{\pi}{8}$$

Decimal approximation:

0.392699081698724154807830422909937860524646174921888227621...

0.39269908169…

Property:

$\frac{\pi}{8}$ is a transcendental number

Alternative representations:

$$\frac{\pi}{8} = \frac{180\,°}{8}$$

$$\frac{\pi}{8} = -\frac{1}{8}\,i\log(-1)$$

$$\frac{\pi}{8} = \frac{1}{8}\cos^{-1}(-1)$$

Series representations:

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

$$\frac{\pi}{8} = \sum_{k=0}^{\infty} -\frac{(-1)^k\,1195^{-1-2k}\left(5^{1+2k}-4\times 239^{1+2k}\right)}{2(1+2k)}$$

$$\frac{\pi}{8} = \frac{1}{8}\sum_{k=0}^{\infty}\left(-\frac{1}{4}\right)^k\left(\frac{1}{1+2k}+\frac{2}{1+4k}+\frac{1}{3+4k}\right)$$

Integral representations:

$$\frac{\pi}{8} = \frac{1}{2}\int_0^1\sqrt{1-t^2}\,dt$$

$$\frac{\pi}{8} = \frac{1}{4} \int_0^1 \frac{1}{\sqrt{1-t^2}}\, dt$$

$$\frac{\pi}{8} = \frac{1}{4} \int_0^\infty \frac{1}{1+t^2}\, dt$$

Thence, we obtain the following approximation:

0.3867814004498… ≈ 0.39269908169…

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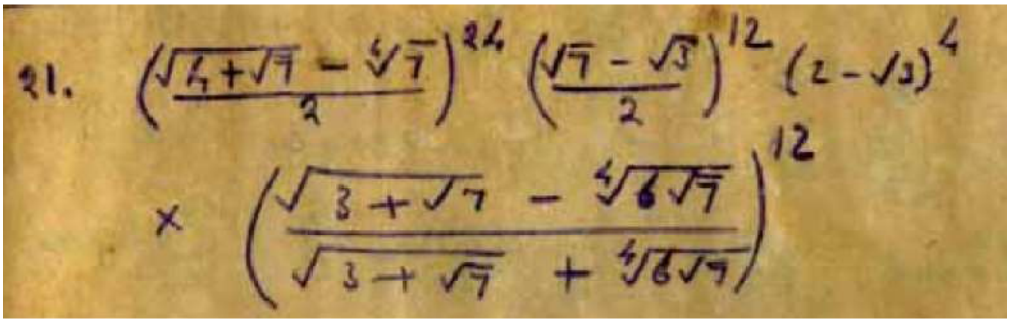

$$21.\quad \left(\frac{\sqrt{4+\sqrt{7}} - \sqrt[4]{7}}{2}\right)^{24} \left(\frac{\sqrt{7}-\sqrt{3}}{2}\right)^{12} (2-\sqrt{3})^4 \times \left(\frac{\sqrt{3+\sqrt{7}} - \sqrt[4]{6\sqrt{7}}}{\sqrt{3+\sqrt{7}} + \sqrt[4]{6\sqrt{7}}}\right)^{12}$$

((((4+sqrt(7))^(1/2)-7^(1/4))/2))^24 ((((sqrt(7)-sqrt(3))/2)))^12 (2-sqrt(3))^4

Input:

$$\left(\frac{1}{2}\left(\sqrt{4+\sqrt{7}} - \sqrt[4]{7}\right)\right)^{24} \left(\frac{1}{2}\left(\sqrt{7}-\sqrt{3}\right)\right)^{12} \left(2-\sqrt{3}\right)^4$$

Result:

$$\frac{(2-\sqrt{3})^4 (\sqrt{7}-\sqrt{3})^{12} \left(\sqrt{4+\sqrt{7}} - \sqrt[4]{7}\right)^{24}}{68\,719\,476\,736}$$

Decimal approximation:

$7.6743522065352568228609522442607551836321317036076639... \times 10^{-15}$

$7.674352206\ldots * 10^{-15}$ partial result

Alternate forms:

$$\frac{\left(\sqrt{2} - 2\sqrt[4]{7} + \sqrt{14}\right)^{24} (6049 - 1320\sqrt{21})(97 - 56\sqrt{3})}{281\,474\,976\,710\,656}$$

$$\frac{(56\sqrt{3}-97)(1320\sqrt{21}-6049)\left(\sqrt[4]{7}-\sqrt{4+\sqrt{7}}\right)^{24}}{16\,777\,216}$$

$$\frac{(\sqrt{3}-2)^4(\sqrt{3}-\sqrt{7})^{12}\left(\sqrt[4]{7}-\sqrt{4+\sqrt{7}}\right)^{24}}{68\,719\,476\,736}$$

Minimal polynomial:

$$x^8 - 130\,304\,157\,678\,344\,x^7 - 8\,195\,774\,528\,503\,268\,x^6 - 239\,731\,694\,313\,092\,408\,x^5 + 11\,993\,055\,999\,268\,936\,774\,x^4 - 239\,731\,694\,313\,092\,408\,x^3 - 8\,195\,774\,528\,503\,268\,x^2 - 130\,304\,157\,678\,344\,x + 1$$

7.6743522065352568228609522442607551836321317036076639×10^-15 (((((3+sqrt(7))^(1/2)-(((6sqrt(7)))^(1/4)))))/(((3+sqrt(7))^(1/2)+(((6sqrt(7)))^(1/4)))))^12

Input interpretation:

$$7.6743522065352568228609522442607551836321317036076639\times 10^{-15}\left(\frac{\sqrt{3+\sqrt{7}}-\sqrt[4]{6\sqrt{7}}}{\sqrt{3+\sqrt{7}}+\sqrt[4]{6\sqrt{7}}}\right)^{12}$$

Result:

$$1.4265156589787652991911067080390673372628164467685711\ldots\times 10^{-27}$$

1.4265156589...*10^{-27} final result

We note that:

10^27*sqrt(139/108)*7.6743522065352568×10^-15*(((((3+sqrt(7))^(1/2)-(((6sqrt(7)))^(1/4)))))/(((3+sqrt(7))^(1/2)+(((6sqrt(7)))^(1/4)))))^12

Input interpretation:

$$10^{27}\sqrt{\frac{139}{108}}\times 7.6743522065352568\times 10^{-15}\left(\frac{\sqrt{3+\sqrt{7}}-\sqrt[4]{6\sqrt{7}}}{\sqrt{3+\sqrt{7}}+\sqrt[4]{6\sqrt{7}}}\right)^{12}$$

Result:

1.6183485598846428...

1.61834855988....

This result is a very good approximation to the value of the golden ratio 1,618033988749...

And that:

(1.08344476)^2*7.6743522065352568×10^-15*(((((3+sqrt(7))^(1/2)-(((6sqrt(7)))^(1/4)))))/(((3+sqrt(7))^(1/2)+(((6sqrt(7)))^(1/4)))))^12

Where 1.08344476 is a value of a Ramanujan mock theta function

Input interpretation:

$$1.08344476^2 \times 7.6743522065352568 \times 10^{-15} \left(\frac{\sqrt{3+\sqrt{7}} - \sqrt[4]{6\sqrt{7}}}{\sqrt{3+\sqrt{7}} + \sqrt[4]{6\sqrt{7}}}\right)^{12}$$

Result:

$1.67451904... \times 10^{-27}$

$1.67451904...*10^{-27}$ result very near to the neutron mass

And also:

(((((7.6743522065352568×10^-15*(((((3+sqrt(7))^(1/2)-(((6sqrt(7)))^(1/4)))))/(((3+sqrt(7))^(1/2)+(((6sqrt(7)))^(1/4)))))^12)))))^1/4096

Input interpretation:

$$\sqrt[4096]{7.6743522065352568 \times 10^{-15} \left(\frac{\sqrt{3+\sqrt{7}} - \sqrt[4]{6\sqrt{7}}}{\sqrt{3+\sqrt{7}} + \sqrt[4]{6\sqrt{7}}}\right)^{12}}$$

Result:

0.985021859217281826707...

0.98502185921.... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243 = \phi}$

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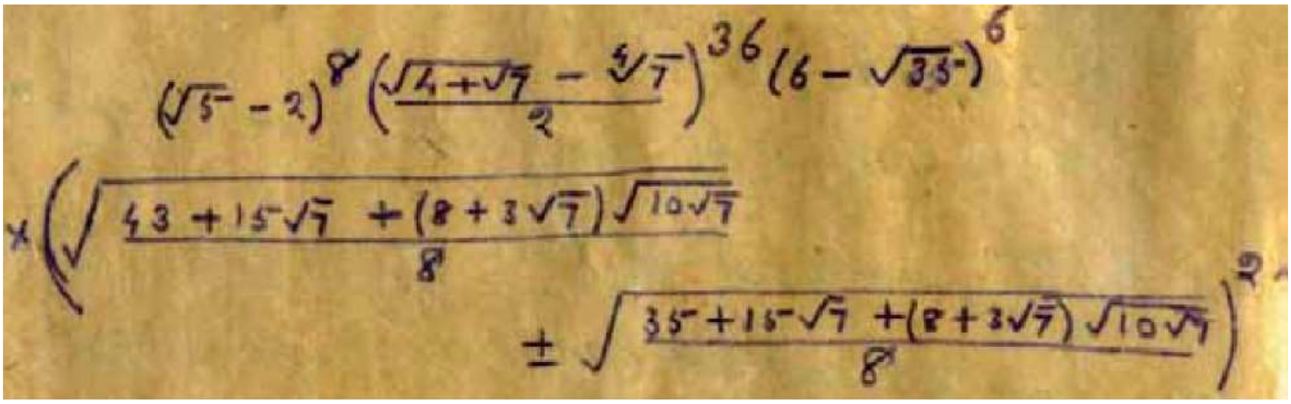

$$(\sqrt{5}-2)^8\left(\frac{\sqrt{4+\sqrt{7}}-\sqrt[4]{7}}{2}\right)^{36}(6-\sqrt{35})^6$$
$$\times\left(\sqrt{\frac{43+15\sqrt{7}+(8+3\sqrt{7})\sqrt{10\sqrt{7}}}{8}}\pm\sqrt{\frac{35+15\sqrt{7}+(8+3\sqrt{7})\sqrt{10\sqrt{7}}}{8}}\right)^2$$

(sqrt(5)-2)^8 ((((((sqrt((4+sqrt(7))))-7^(1/4))*1/2))))^36 (6-sqrt(35))^6

Input:

$$\left(\sqrt{5}-2\right)^8\left(\left(\sqrt{4+\sqrt{7}}-\sqrt[4]{7}\right)\times\frac{1}{2}\right)^{36}\left(6-\sqrt{35}\right)^6$$

Result:

$$\frac{(\sqrt{5}-2)^8(6-\sqrt{35})^6\left(\sqrt{4+\sqrt{7}}-\sqrt[4]{7}\right)^{36}}{68\,719\,476\,736}$$

Decimal approximation:

$8.1435630136662985455863013922184002683765248572915873\ldots\times10^{-24}$

$8.1435630136\ldots*10^{-24}$ partial result

Alternate forms:

$$\frac{(51\,841-23\,184\sqrt{5})\left(\sqrt{2}-2\sqrt[4]{7}+\sqrt{14}\right)^{36}(1\,431\,431-241\,956\sqrt{35})}{4\,722\,366\,482\,869\,645\,213\,696}$$

$$\frac{(\sqrt{5}-2)^8(\sqrt{35}-6)^6\left(\sqrt[4]{7}-\sqrt{4+\sqrt{7}}\right)^{36}}{68\,719\,476\,736}$$

$$\text{root of } x^8 - 122796372831134002226568\,x^7 - 6082675245844260868361956\,x^6 - 80784549219380295919203000\,x^5 + 185879267864728579135393350\,x^4 - 80784549219380295919203000\,x^3 - 6082675245844260868361956\,x^2 - 122796372831134002226568\,x + 1 \text{ near } x = 8.14356\times 10^{-24}$$

Minimal polynomial:

$$x^8 - 122796372831134002226568\,x^7 - 6082675245844260868361956\,x^6 - 80784549219380295919203000\,x^5 + 185879267864728579135393350\,x^4 - 80784549219380295919203000\,x^3 - 6082675245844260868361956\,x^2 - 122796372831134002226568\,x + 1$$

[(((((sqrt((((43+15sqrt(7)+(8+3sqrt(7))((10sqrt(7))^1/2)))
*1/8)))))))+(((((sqrt((((35+15sqrt(7)+(8+3sqrt(7)) ((10sqrt(7))^1/2))) *1/8)))))))]^2

Input:

$$\left(\sqrt{\left(43+15\sqrt{7}+\left(8+3\sqrt{7}\right)\sqrt{10\sqrt{7}}\right)\times\frac{1}{8}}+\sqrt{\left(35+15\sqrt{7}+\left(8+3\sqrt{7}\right)\sqrt{10\sqrt{7}}\right)\times\frac{1}{8}}\right)^2$$

Result:

$$\left(\frac{1}{2\sqrt{\frac{2}{35+15\sqrt{7}+\sqrt[4]{7}\sqrt{10}\left(8+3\sqrt{7}\right)}}}+\frac{1}{2\sqrt{\frac{2}{43+15\sqrt{7}+\sqrt[4]{7}\sqrt{10}\left(8+3\sqrt{7}\right)}}}\right)^2$$

Decimal approximation:

80.318805182061020444134952236985586884363865143852183567 10...

80.3188051… partial result

Alternate forms:

$$\frac{1}{16}\left(\sqrt{2\left(35+15\sqrt{7}+8\sqrt[4]{7}\sqrt{10}+3\times 7^{3/4}\sqrt{10}\right)}+\sqrt{2\left(43+15\sqrt{7}+8\sqrt[4]{7}\sqrt{10}+3\times 7^{3/4}\sqrt{10}\right)}\right)^2$$

root of $x^8 - 78x^7 - 182x^6 - 336x^5 - 385x^4 - 336x^3 - 182x^2 - 78x + 1$ near $x = 80.3188$

$$\frac{1}{8}\left(\sqrt{35 + 15\sqrt{7} + 8\sqrt[4]{7}\sqrt{10} + 3 \times 7^{3/4}\sqrt{10}} + \sqrt{43 + 15\sqrt{7} + 8\sqrt[4]{7}\sqrt{10} + 3 \times 7^{3/4}\sqrt{10}}\right)^2$$

Minimal polynomial:

$x^8 - 78x^7 - 182x^6 - 336x^5 - 385x^4 - 336x^3 - 182x^2 - 78x + 1$

8.1435630136662985455863×10^-24 [(((((sqrt((((43+15sqrt(7)+(8+3sqrt(7))((10sqrt(7))^1/2))) *1/8)))))))+(((((sqrt((((35+15sqrt(7)+(8+3sqrt(7)) ((10sqrt(7))^1/2))) *1/8)))))))]^2

Input interpretation:

$$8.1435630136662985455863 \times 10^{-24}\left(\sqrt{\left(43 + 15\sqrt{7} + \left(8 + 3\sqrt{7}\right)\sqrt{10\sqrt{7}}\right) \times \frac{1}{8}} + \sqrt{\left(35 + 15\sqrt{7} + \left(8 + 3\sqrt{7}\right)\sqrt{10\sqrt{7}}\right) \times \frac{1}{8}}\right)^2$$

Result:

$6.5408125118250116027393\ldots \times 10^{-22}$

6.540812511825...*10^{-22} final result

And we obtain:

(((((8.1435630136662985455863×10^-24 [(((((sqrt((((43+15sqrt(7)+(8+3sqrt(7))((10sqrt(7))^1/2))) *1/8)))))))+(((((sqrt((((35+15sqrt(7)+(8+3sqrt(7))((10sqrt(7))^1/2))) *1/8)))))))]^2)))))^1/4096

Input interpretation:

$$\left(8.1435630136662985455863\times 10^{-24}\left(\sqrt{\left(43+15\sqrt{7}+\left(8+3\sqrt{7}\right)\sqrt{10\sqrt{7}}\right)\times\frac{1}{8}}+\sqrt{\left(35+15\sqrt{7}+\left(8+3\sqrt{7}\right)\sqrt{10\sqrt{7}}\right)\times\frac{1}{8}}\right)^2\right)^{\wedge}(1/4096)$$

Result:

0.98816174084970878228173413 8...

0.9881617408497... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243}=\boldsymbol{\phi}$

Now, dividing the results of the two expressions, we obtain:

6.5408125118250116027393 × 10^-22 / 1.4265156589787652991 9 × 10^-27

Input interpretation:

$$\frac{6.5408125118250116027393\times 10^{-22}}{1.42651565897876529919\times 10^{-27}}$$

Result:

458516.69910918070419576252669640139500509171860874732330 66...

458516.699109....

And:

(((((6.5408125118250116027393×10^-22/1.42651565897876529919×10^-27)))))^1/26

Input interpretation:

$$\sqrt[26]{\frac{6.540812511825011602739 3\times 10^{-22}}{1.42651565897876529919\times 10^{-27}}}$$

Result:

1.65098994815862970121 6...

1.6509899481586297....

1/10^27(((((21/10^3+(((((6.5408125118250116027393×10^-22/1.42651565897876529919×10^-27)))))^1/26)))))

Input interpretation:

$$\frac{1}{10^{27}}\left(\frac{21}{10^3}+\sqrt[26]{\frac{6.5408125118250116027393\times 10^{-22}}{1.42651565897876529919\times 10^{-27}}}\right)$$

Result:

$1.67198994815862970121 6\ldots\times 10^{-27}$

$1.67198994\ldots*10^{-27}$ result practically equal to the value of the formula:

$$m_{p'} = 2\times\frac{\eta}{R}m_P = 1.6714213\times 10^{-24}\text{ gm}$$

that is the holographic proton mass (N. Haramein)

(((((6.5408125118250116027393×10^-22/1.42651565897876529919×10^-27)))))*1/(199+47+11)

Where 199, 47 and 11 are Lucas numbers

Input interpretation:

$$\frac{6.5408125118250116027393\times 10^{-22}}{1.42651565897876529919\times 10^{-27}}\times\frac{1}{199+47+11}$$

Result:

1784.11166968552803189012656302101710118712730976166273660 1...

1784.111669... result in the range of the hypothetical mass of Gluino (gluino = 1785.16 GeV).

(((((6.5408125118250116027393 × 10^-22 / 1.42651565897876529919 × 10^-27)))))*1/(199+47+11) -55

Where 55 is a Fibonacci number

Input interpretation:

$$\frac{6.5408125118250116027393\times 10^{-22}}{1.42651565897876529919\times 10^{-27}}\times\frac{1}{199+47+11}-55$$

Result:

1729.111669685528031890126563021017101187127309761662736601...

1729.111669...

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

(-4096+1024+128+16)+1/6(((((6.5408125118250116027393×10^-22/ 1.42651565897876529919 × 10^-27)))))

Input interpretation:

$$(-4096+1024+128+16)+\frac{1}{6}\times\frac{6.5408125118250116027393\times 10^{-22}}{1.42651565897876529919\times 10^{-27}}$$

Result:

73491.44985153011736596042111606689916751528643479122055110...

73491.4498515...

Thence, we have the following mathematical connection:

$$\left((-4096+1024+128+16)+\frac{1}{6}\times\frac{6.5408125118250116027393\times10^{-22}}{1.4265156589787652991 9\times10^{-27}}\right)=73491.4498 \Rightarrow$$

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

$$-3927+2\sqrt[13]{2.2983717437\times10^{59}+2.0823329825883\times10^{59}}$$

$= 73490.8437525.... \Rightarrow$

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

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

$= 73491.788325481187105491595720422205480251957265634133987 00...$

$= 73491.7883254... \Rightarrow$

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

$$/(26\times4)^2-24=\left(\frac{7.9313976505275\times10^8}{(26\times4)^2-24}\right)=73493.30662\ldots$$

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

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Gravitational waves from walking technicolor

Kohtaroh Miura, Hiroshi Ohki, Saeko Otani and Koichi Yamawaki

Now, we have that:

$$m_{p^a}^2(s^0, \Delta m_p) = (\Delta m_p)^2, \tag{2.24}$$

$$V_{\text{eff}} = \frac{N_f^2 - 1}{64\pi^2} m_{s^i}^4(s^0) \left(\ln \frac{m_{s^i}^2(s^0)}{\mu_{GW}^2} - \frac{3}{2} \right) + C, \tag{2.36}$$

Using the mass functions given in eq. (2.24), the total effective potential $V_{\text{eff}}(s^0, T)$ with the daisy diagrams is given as

$$\begin{aligned} V_{\text{eff}}(s^0, T) = &\frac{N_f^2 - 1}{64\pi^2} \mathcal{M}_{s^i}^4(s^0, \Delta m_p, T) \left(\ln \frac{\mathcal{M}_{s^i}^2(s^0, \Delta m_p, T)}{\mu_{GW}^2} - \frac{3}{2} \right) \\ &+ \frac{T^4}{2\pi^2}(N_f^2 - 1) J_B \left(\mathcal{M}_{s^i}^2(s^0, \Delta m_p, T)/T^2 \right) + C(T) \,. \end{aligned} \tag{3.4}$$

$$\Pi(T) = \frac{T^2}{6} \left((N_f^2 + 1) f_1 + 2 N_f f_2 \right) \Big|_{f_1 = -f_2/N_f}, \tag{3.3}$$

is the one-loop self-energy in the infrared limit in the leading order of the high temperature expansion $\propto T^2$ [48]. (For a pedagogical review, see [49]).

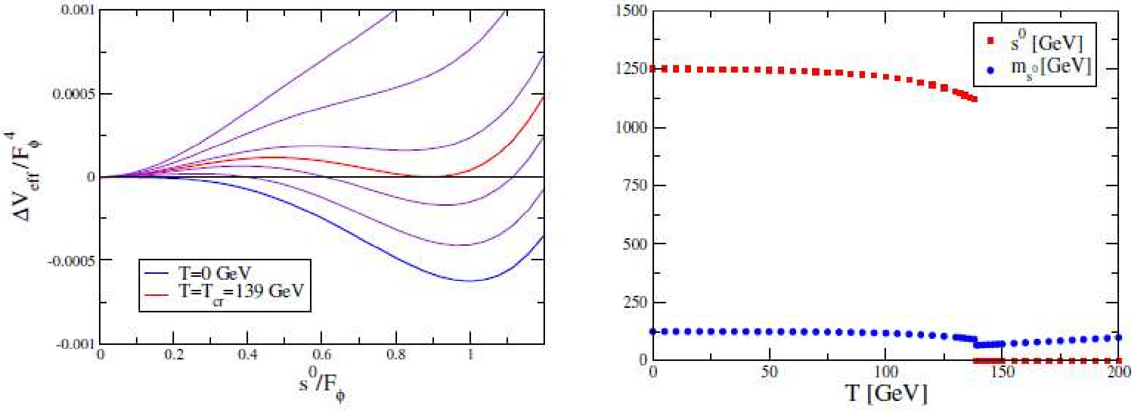

Figure 2. (Left) Effective potential ($\Delta V_{\rm eff} \equiv V_{\rm eff}(s^0, T) - V_{\rm eff}(0, T)$) for various temperature. The red and blue lines represent the potential at $T = T_{\rm cr} = 139\,\text{GeV}$ and zero temperature, respectively. (Right) The vev $\langle s^0 \rangle$ (red squares) and dilaton mass m_{s^0} (blue circles) determined at the potential minimum as a function of temperature.

The dilaton mass m_{s^0} (blue points in the right panel) is 125 GeV at $T = 0$, and decreases for larger T in the broken phase, and shows a singular behavior at the critical temperature $T_{\rm cr}$. In the symmetric phase, m_{s^0} starts increasing due to the thermal mass effects $\Pi(T)$ given in eq. (3.3).

Thence, the dilaton mass is calculated as a type of Higgs boson: 125 GeV for T = 0

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$$\int_0^\infty \frac{\cos 2nx}{\cosh \pi\sqrt{x} + \cos \pi\sqrt{x}}\,dx = \frac{e^{-n}}{\cosh\frac{\pi}{2}} - \frac{3e^{-9n}}{\cosh\frac{3\pi}{2}} + \frac{5e^{-25n}}{\cosh\frac{5\pi}{2}} - \&c$$

For n = 2, we obtain:

((e^-2) / cosh(Pi/2)) ((3e^-18) / cosh(3Pi/2)) ((5e^-50) / cosh(5Pi/2))

Input:

$$\frac{1}{e^2 \cosh\left(\frac{\pi}{2}\right)} \times \frac{\frac{3}{e^{18}}}{\cosh\left(3 \times \frac{\pi}{2}\right)} \times \frac{\frac{5}{e^{50}}}{\cosh\left(5 \times \frac{\pi}{2}\right)}$$

cosh(x) is the hyperbolic cosine function

Exact result:

$$\frac{15 \operatorname{sech}\left(\frac{\pi}{2}\right) \operatorname{sech}\left(\frac{3\pi}{2}\right) \operatorname{sech}\left(\frac{5\pi}{2}\right)}{e^{70}}$$

sech(x) is the hyperbolic secant function

Decimal approximation:

$3.3148618728719834337155639980349020699441487997548332\ldots \times 10^{-35}$

$3.31486187287198\ldots*10^{-35}$

Alternate forms:

$$\frac{30 e^{\pi/2-70} \operatorname{sech}\left(\frac{3\pi}{2}\right) \operatorname{sech}\left(\frac{5\pi}{2}\right)}{1+e^{\pi}}$$

$$\frac{60}{e^{70}\left(\cosh\left(\frac{\pi}{2}\right)+\cosh\left(\frac{3\pi}{2}\right)+\cosh\left(\frac{7\pi}{2}\right)+\cosh\left(\frac{9\pi}{2}\right)\right)}$$

$$\frac{15 \operatorname{sech}^3\left(\frac{\pi}{2}\right)}{e^{70}\left(2\cosh(\pi)-1\right)\left(1-2\cosh(\pi)+2\cosh(2\pi)\right)}$$

Alternative representations:

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)} = \frac{15}{e^{50}\, e^{18}\, e^{2}\cos\left(\frac{i\pi}{2}\right)\cos\left(\frac{3i\pi}{2}\right)\cos\left(\frac{5i\pi}{2}\right)}$$

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)} = \frac{15}{e^{50}\, e^{18}\, e^{2}\cos\left(-\frac{i\pi}{2}\right)\cos\left(-\frac{3i\pi}{2}\right)\cos\left(-\frac{5i\pi}{2}\right)}$$

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)} = \frac{15}{\frac{e^{50}\, e^{18}\, e^{2}}{\sec\left(\frac{i\pi}{2}\right)\sec\left(\frac{3i\pi}{2}\right)\sec\left(\frac{5i\pi}{2}\right)}}$$

Series representations:

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)} =$$
$$120\, e^{-70-(9\pi)/2} \sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty} \exp((-5+i)\pi k_1-(3-i)\pi k_2-(1-i)\pi k_3)$$

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^2\cosh\left(\frac{\pi}{2}\right)} = \frac{120\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{(-1)^{k_1+k_2+k_3}(1+2k_1)(1+2k_2)(1+2k_3)}{(1+2k_1+2k_1^2)(5+2k_2+2k_2^2)(13+2k_3+2k_3^2)}}{e^{70}\pi^3}$$

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^2\cosh\left(\frac{\pi}{2}\right)} = -\frac{1}{e^{70}}15i\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{1}{k_1!k_2!k_3!}\left(\mathrm{Li}_{-k_1}(-ie^{z_0})-\mathrm{Li}_{-k_1}(ie^{z_0})\right)\left(\mathrm{Li}_{-k_2}(-ie^{z_0})-\mathrm{Li}_{-k_2}(ie^{z_0})\right)\left(\mathrm{Li}_{-k_3}(-ie^{z_0})-\mathrm{Li}_{-k_3}(ie^{z_0})\right)\left(\frac{\pi}{2}-z_0\right)^{k_1}\left(\frac{3\pi}{2}-z_0\right)^{k_2}\left(\frac{5\pi}{2}-z_0\right)^{k_3} \quad \text{for } \frac{1}{2}+\frac{iz_0}{\pi}\notin\mathbb{Z}$$

Integral representation:

$$\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^2\cosh\left(\frac{\pi}{2}\right)} = \frac{120\left(\int_0^{\infty}\frac{t^i}{1+t^2}\,dt\right)\left(\int_0^{\infty}\frac{t^{3i}}{1+t^2}\,dt\right)\int_0^{\infty}\frac{t^{5i}}{1+t^2}\,dt}{e^{70}\pi^3}$$

1/((((((e^-2) / cosh(Pi/2)) ((3e^-18) / cosh(3Pi/2)) ((5e^-50) / cosh(5Pi/2))))))^1/16 – 18

Input:

$$\frac{1}{\sqrt[16]{\frac{1}{e^2\cosh\left(\frac{\pi}{2}\right)}\times\frac{\frac{3}{e^{18}}}{\cosh\left(3\times\frac{\pi}{2}\right)}\times\frac{\frac{5}{e^{50}}}{\cosh\left(5\times\frac{\pi}{2}\right)}}} - 18$$

cosh(x) is the hyperbolic cosine function

Exact result:

$$\frac{e^{35/8}}{\sqrt[16]{15\,\mathrm{sech}\left(\frac{\pi}{2}\right)\mathrm{sech}\left(\frac{3\pi}{2}\right)\mathrm{sech}\left(\frac{5\pi}{2}\right)}} - 18$$

sech(x) is the hyperbolic secant function

Decimal approximation:

124.87982519785249842927581729380948147294977537455899128 56...

124.87982519….. result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

Alternate forms:

$$e^{35/8-\pi/32}\sqrt[16]{\frac{1}{30}\left(1+e^{\pi}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}-18$$

$$\frac{1}{30}\left(2^{7/8}\times 15^{15/16}\, e^{35/8}\sqrt[16]{\cosh\left(\frac{\pi}{2}\right)+\cosh\left(\frac{3\pi}{2}\right)+\cosh\left(\frac{7\pi}{2}\right)+\cosh\left(\frac{9\pi}{2}\right)}-540\right)$$

$$\frac{e^{35/8}\sqrt[16]{\frac{1}{15}\left(1+\cosh(\pi)\right)\left(1+\cosh(3\pi)\right)\left(1+\cosh(5\pi)\right)\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{2^{3/16}}-18$$

Alternative representations:

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=-18+\frac{1}{\sqrt[16]{\frac{15}{e^{50}\,e^{18}\,e^{2}\cos\left(\frac{i\pi}{2}\right)\cos\left(\frac{3i\pi}{2}\right)\cos\left(\frac{5i\pi}{2}\right)}}}$$

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=$$
$$-18+\frac{1}{\sqrt[16]{\frac{15}{e^{50}\,e^{18}\,e^{2}\cos\left(-\frac{i\pi}{2}\right)\cos\left(-\frac{3i\pi}{2}\right)\cos\left(-\frac{5i\pi}{2}\right)}}}$$

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=-18+\frac{1}{\sqrt[16]{\frac{15}{\frac{e^{50}\,e^{18}\,e^{2}}{\sec\left(\frac{i\pi}{2}\right)\sec\left(\frac{3i\pi}{2}\right)\sec\left(\frac{5i\pi}{2}\right)}}}}$$

Series representations:

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=$$

$$\left(2^{13/16}\times 15^{15/16}\,e^{35/8+(9\pi)/32}\left(\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}(-1)^{k_1+k_2+k_3}\,e^{-5\pi k_1-3\pi k_2-\pi k_3}\right)^{15/16}-\right.$$

$$\left.540\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}(-1)^{k_1+k_2+k_3}\,e^{-5\pi k_1-3\pi k_2-\pi k_3}\right)\Big/$$

$$\left(30\left(\sum_{k=0}^{\infty}e^{(-5+i)k\pi}\right)\left(\sum_{k=0}^{\infty}e^{(-3+i)k\pi}\right)\sum_{k=0}^{\infty}e^{(-1+i)k\pi}\right)$$

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=$$

$$\left(15^{15/16}\,e^{35/8}\left(\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{(-1)^{k_1+k_2+k_3}\,(1+2k_1)(1+2k_2)(1+2k_3)}{\left(\frac{\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_1\right)^2\right)\left(\frac{9\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_2\right)^2\right)\left(\frac{25\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_3\right)^2\right)}\right)^{15/16}-270\,\pi^{3/16}\right.$$

$$\left.\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{(-1)^{k_1+k_2+k_3}\,(1+2k_1)(1+2k_2)(1+2k_3)}{\left(\frac{\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_1\right)^2\right)\left(\frac{9\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_2\right)^2\right)\left(\frac{25\pi^2}{4}+\pi^2\left(\frac{1}{2}+k_3\right)^2\right)}\right)\Big/$$

$$\left(15\,\pi^{3/16}\left(\sum_{k=0}^{\infty}\frac{2(-1)^k(1+2k)}{(1+2k+2k^2)\pi^2}\right)\left(\sum_{k=0}^{\infty}\frac{2(-1)^k(1+2k)}{(5+2k+2k^2)\pi^2}\right)\sum_{k=0}^{\infty}\frac{2(-1)^k(1+2k)}{(13+2k+2k^2)\pi^2}\right)$$

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=$$

$$\left(i\left(15^{15/16}\,e^{35/8}\left(-i\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{1}{k_1!\,k_2!\,k_3!}\left(\mathrm{Li}_{-k_1}\left(-i\,e^{z_0}\right)-\mathrm{Li}_{-k_1}\left(i\,e^{z_0}\right)\right)\left(\mathrm{Li}_{-k_2}\left(-i\,e^{z_0}\right)-\mathrm{Li}_{-k_2}\left(i\,e^{z_0}\right)\right)\left(\mathrm{Li}_{-k_3}\left(-i\,e^{z_0}\right)-\mathrm{Li}_{-k_3}\left(i\,e^{z_0}\right)\right)\left(\frac{\pi}{2}-z_0\right)^{k_1}\left(\frac{3\pi}{2}-z_0\right)^{k_2}\left(\frac{5\pi}{2}-z_0\right)^{k_3}\right)^{15/16}+270\,i\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{1}{k_1!\,k_2!\,k_3!}\left(\mathrm{Li}_{-k_1}\left(-i\,e^{z_0}\right)-\mathrm{Li}_{-k_1}\left(i\,e^{z_0}\right)\right)\left(\mathrm{Li}_{-k_2}\left(-i\,e^{z_0}\right)-\mathrm{Li}_{-k_2}\left(i\,e^{z_0}\right)\right)\left(\mathrm{Li}_{-k_3}\left(-i\,e^{z_0}\right)-\mathrm{Li}_{-k_3}\left(i\,e^{z_0}\right)\right)\left(\frac{\pi}{2}-z_0\right)^{k_1}\left(\frac{3\pi}{2}-z_0\right)^{k_2}\left(\frac{5\pi}{2}-z_0\right)^{k_3}\right)\right)\Bigg/\left(15\left(\sum_{k=0}^{\infty}\frac{\left(\mathrm{Li}_{-k}(-i\,e^{z_0})-\mathrm{Li}_{-k}(i\,e^{z_0})\right)\left(\frac{\pi}{2}-z_0\right)^{k}}{k!}\right)\left(\sum_{k=0}^{\infty}\frac{\left(\mathrm{Li}_{-k}(-i\,e^{z_0})-\mathrm{Li}_{-k}(i\,e^{z_0})\right)\left(\frac{3\pi}{2}-z_0\right)^{k}}{k!}\right)\sum_{k=0}^{\infty}\frac{\left(\mathrm{Li}_{-k}(-i\,e^{z_0})-\mathrm{Li}_{-k}(i\,e^{z_0})\right)\left(\frac{5\pi}{2}-z_0\right)^{k}}{k!}\right)$$

$$\text{for } \frac{1}{2}+\frac{i\,z_0}{\pi}\notin\mathbb{Z}$$

Integral representation:

$$\frac{1}{\sqrt[16]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}}-18=$$

$$\left(-540\left(\int_0^{\infty}\frac{t^{i}}{1+t^2}\,dt\right)\left(\int_0^{\infty}\frac{t^{3i}}{1+t^2}\,dt\right)\int_0^{\infty}\frac{t^{5i}}{1+t^2}\,dt+2^{13/16}\times 15^{15/16}\,e^{35/8}\,\pi^{3/16}\left(\left(\int_0^{\infty}\frac{t^{i}}{1+t^2}\,dt\right)\left(\int_0^{\infty}\frac{t^{3i}}{1+t^2}\,dt\right)\int_0^{\infty}\frac{t^{5i}}{1+t^2}\,dt\right)^{15/16}\right)\Bigg/\left(30\left(\int_0^{\infty}\frac{t^{i}}{1+t^2}\,dt\right)\left(\int_0^{\infty}\frac{t^{3i}}{1+t^2}\,dt\right)\int_0^{\infty}\frac{t^{5i}}{1+t^2}\,dt\right)$$

((((((e^-2) / cosh(Pi/2)) ((3e^-18) / cosh(3Pi/2)) ((5e^-50) / cosh(5Pi/2))))))^1/4096

Input:

$$\sqrt[4096]{\frac{1}{e^2\cosh\left(\frac{\pi}{2}\right)}\times\frac{\frac{3}{e^{18}}}{\cosh\left(3\times\frac{\pi}{2}\right)}\times\frac{\frac{5}{e^{50}}}{\cosh\left(5\times\frac{\pi}{2}\right)}}$$

$\cosh(x)$ is the hyperbolic cosine function

Exact result:

$$\frac{\sqrt[4096]{15\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{e^{35/2048}}$$

$\operatorname{sech}(x)$ is the hyperbolic secant function

Decimal approximation:

0.980803811484862962343073031874634139232135205981617942357...

0.98080381148…. result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243}=\boldsymbol{\phi}$

Alternate forms:

$$e^{\pi/8192-35/2048}\sqrt[4096]{\frac{30\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}{1+e^{\pi}}}$$

$$\frac{\sqrt[2048]{2}\ \sqrt[4096]{\frac{15}{\cosh\left(\frac{\pi}{2}\right)+\cosh\left(\frac{3\pi}{2}\right)+\cosh\left(\frac{7\pi}{2}\right)+\cosh\left(\frac{9\pi}{2}\right)}}}{e^{35/2048}}$$

$$\frac{2^{3/4096}\ \sqrt[4096]{\frac{15\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}{(1+\cosh(\pi))(1+\cosh(3\pi))(1+\cosh(5\pi))}}}{e^{35/2048}}$$

All 4096th roots of (15 sech(π/2) sech((3 π)/2) sech((5 π)/2))/e^70:

$$\frac{e^0\ \sqrt[4096]{15\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{e^{35/2048}} \approx 0.980804 \text{ (real, principal root)}$$

$$\frac{e^{(i\pi)/2048}\ \sqrt[4096]{15\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{e^{35/2048}} \approx 0.980803+0.0015045\,i$$

$$\frac{e^{(i\pi)/1024}\ \sqrt[4096]{15\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{e^{35/2048}} \approx 0.980799+0.0030091\,i$$

$$\frac{e^{(3i\pi)/2048}\ \sqrt[4096]{15\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{e^{35/2048}} \approx 0.980793+0.0045136\,i$$

$$\frac{e^{(i\pi)/512}\ \sqrt[4096]{15\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{5\pi}{2}\right)}}{e^{35/2048}} \approx 0.980785+0.006018\,i$$

Alternative representations:

$$\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^2\cosh\left(\frac{\pi}{2}\right)}} =$$

$$\sqrt[4096]{\frac{15}{e^{50}\ e^{18}\ e^2\cos\left(\frac{i\pi}{2}\right)\cos\left(\frac{3i\pi}{2}\right)\cos\left(\frac{5i\pi}{2}\right)}}$$

$$\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}} = \sqrt[4096]{\frac{15}{e^{50}\,e^{18}\,e^{2}\cos\left(-\frac{i\pi}{2}\right)\cos\left(-\frac{3i\pi}{2}\right)\cos\left(-\frac{5i\pi}{2}\right)}}$$

$$\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}} = \sqrt[4096]{\frac{15}{\frac{e^{50}\,e^{18}\,e^{2}}{\sec\left(\frac{i\pi}{2}\right)\sec\left(\frac{3i\pi}{2}\right)\sec\left(\frac{5i\pi}{2}\right)}}}$$

Series representations:

$$\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}} = 2^{3/4096}\sqrt[4096]{15}\; e^{-35/2048-(9\pi)/8192}\sqrt[4096]{\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\exp((-5+i)\pi k_1-(3-i)\pi k_2-(1-i)\pi k_3)}$$

$$\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}} = \frac{2^{3/4096}\sqrt[4096]{15}\sqrt[4096]{\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{(-1)^{k_1+k_2+k_3}(1+2k_1)(1+2k_2)(1+2k_3)}{(1+2k_1+2k_1^2)(5+2k_2+2k_2^2)(13+2k_3+2k_3^2)}}}{e^{35/2048}\,\pi^{3/4096}}$$

$$\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}} = \frac{1}{e^{35/2048}}\sqrt[4096]{15}\left(-i\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\sum_{k_3=0}^{\infty}\frac{1}{k_1!\,k_2!\,k_3!}\left(\mathrm{Li}_{-k_1}(-i e^{z_0})-\mathrm{Li}_{-k_1}(i e^{z_0})\right)\left(\mathrm{Li}_{-k_2}(-i e^{z_0})-\mathrm{Li}_{-k_2}(i e^{z_0})\right)\left(\mathrm{Li}_{-k_3}(-i e^{z_0})-\mathrm{Li}_{-k_3}(i e^{z_0})\right)\left(\frac{\pi}{2}-z_0\right)^{k_1}\left(\frac{3\pi}{2}-z_0\right)^{k_2}\left(\frac{5\pi}{2}-z_0\right)^{k_3}\right)\wedge(1/4096) \quad \text{for } \frac{1}{2}+\frac{i z_0}{\pi}\notin\mathbb{Z}$$

Integral representation:

$$\frac{\sqrt[4096]{\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}}=}{\quad}$$

$$\frac{2^{3/4096}\sqrt[4096]{15}\sqrt[4096]{\left(\int_0^\infty \frac{t^i}{1+t^2}\,dt\right)\left(\int_0^\infty \frac{t^{3i}}{1+t^2}\,dt\right)\int_0^\infty \frac{t^{5i}}{1+t^2}\,dt}}{e^{35/2048}\,\pi^{3/4096}}$$

2sqrt[log base 0.98080381148 ((((((e^-2) / cosh(Pi/2)) ((3e^-18) / cosh(3Pi/2)) ((5e^-50) / cosh(5Pi/2))))))]-Pi

Input interpretation:

$$2\sqrt{\log_{0.98080381148}\left(\frac{1}{e^2\cosh\left(\frac{\pi}{2}\right)}\times\frac{\frac{3}{e^{18}}}{\cosh\left(3\times\frac{\pi}{2}\right)}\times\frac{\frac{5}{e^{50}}}{\cosh\left(5\times\frac{\pi}{2}\right)}\right)}-\pi$$

cosh(*x*) is the hyperbolic cosine function

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

Result:

124.8584073...

124.8584073... result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

Alternative representations:

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi=$$

$$-\pi+2\sqrt{\frac{\log\left(\frac{15}{e^{50}\,e^{18}\,e^{2}\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}\right)}{\log(0.980803811480000)}}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi = -\pi+2\sqrt{\log_{0.980803811480000}\left(\frac{15}{e^{50}\,e^{18}\,e^{2}\cos\left(\frac{i\pi}{2}\right)\cos\left(\frac{3i\pi}{2}\right)\cos\left(\frac{5i\pi}{2}\right)}\right)}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi = -\pi+2\sqrt{\log_{0.980803811480000}\left(\frac{15}{e^{50}\,e^{18}\,e^{2}\cos\left(-\frac{i\pi}{2}\right)\cos\left(-\frac{3i\pi}{2}\right)\cos\left(-\frac{5i\pi}{2}\right)}\right)}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi = -\pi+2\sqrt{\log_{0.980803811480000}\left(\frac{15}{\frac{e^{50}\,e^{18}\,e^{2}\left(e^{-\pi/2}+e^{\pi/2}\right)\left(e^{-(3\pi)/2}+e^{(3\pi)/2}\right)\left(e^{-(5\pi)/2}+e^{(5\pi)/2}\right)}{2\times 2\times 2}}\right)}$$

Series representations:

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi = -\pi+2\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1+\frac{15}{e^{70}\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}\right)^k}{k}}{\log(0.980803811480000)}}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi = -\pi+2\sqrt{-1+\log_{0.980803811480000}\left(\frac{15}{e^{70}\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}\right)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\log_{0.980803811480000}\left(\frac{15}{e^{70}\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}\right)\right)^{-k}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi=$$

$$-\pi+2\sqrt{\left(-1.0000000000000\log\left(\frac{15}{e^{70}\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{5\pi}{2}\right)}\right)\left(51.59367468746+\sum_{k=0}^{\infty}(-0.019196188520000)^{k}G(k)\right)\right)}$$

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

Integral representations:

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi=$$

$$-\pi+2\sqrt{\log_{0.980803811480000}\left(\frac{15}{e^{70}\left(\int_{\frac{i\pi}{2}}^{\frac{\pi}{2}}\sinh(t)\,dt\right)\left(\int_{\frac{i\pi}{2}}^{\frac{3\pi}{2}}\sinh(t)\,dt\right)\int_{\frac{i\pi}{2}}^{\frac{5\pi}{2}}\sinh(t)\,dt}\right)}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi=$$

$$-\pi+2\sqrt{\log_{0.980803811480000}\left(\frac{120}{e^{70}\left(2+\pi\int_{0}^{1}\sinh\left(\frac{\pi t}{2}\right)dt\right)\left(2+3\pi\int_{0}^{1}\sinh\left(\frac{3\pi t}{2}\right)dt\right)\left(2+5\pi\int_{0}^{1}\sinh\left(\frac{5\pi t}{2}\right)dt\right)}\right)}$$

$$2\sqrt{\log_{0.980803811480000}\left(\frac{3\times 5}{\left(\left(e^{18}\cosh\left(\frac{3\pi}{2}\right)\right)\left(e^{50}\cosh\left(\frac{5\pi}{2}\right)\right)\right)e^{2}\cosh\left(\frac{\pi}{2}\right)}\right)}-\pi=$$

$$-\pi+2\sqrt{\log_{0.980803811480000}\left((120\,i^{3}\pi^{3})\Big/\left(e^{70}\left(\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\mathcal{A}^{\pi^{2}/(16s)+s}}{\sqrt{s}}\,ds\right)\left(\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\mathcal{A}^{(9\pi^{2})/(16s)+s}}{\sqrt{s}}\,ds\right)\left(\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\mathcal{A}^{(25\pi^{2})/(16s)+s}}{\sqrt{s}}\,ds\right)\sqrt{\pi}^{3}\right)\right)}\quad\text{for }\gamma>0$$

From:

RAMANUJAN'S CONTRIBUTIONS TO EISENSTEIN SERIES, ESPECIALLY IN HIS LOST NOTEBOOK

BRUCE C. BERNDT AND AE JA YEE -

https://faculty.math.illinois.edu/~berndt/articles/aeja5.pdf

$$R(q) := 1 - 504 \sum_{k=1}^{\infty} \frac{k^5 q^k}{1 - q^k}. \qquad (1.4)$$

Define, after Ramanujan,

$$f(-q) := (q;q)_\infty =: e^{-2\pi i\tau/24}\eta(\tau), \qquad q = e^{2\pi i\tau}, \qquad \operatorname{Im}\tau > 0, \qquad (1.6)$$

where η denotes the Dedekind eta-function.

For any complex number τ with $\mathbf{Im}(\tau) > 0$, let $q = e^{2\pi i\tau}$, then the eta function is defined by,

$$\eta(\tau) = e^{\frac{\pi i\tau}{12}} \prod_{n=1}^{\infty}(1 - e^{2n\pi i\tau}) = q^{\frac{1}{24}} \prod_{n=1}^{\infty}(1 - q^n).$$

f(-q) = exp(-2Pi/24)*exp(Pi/12)*(1-exp(2Pi))

Input:

$\exp\left(-2\times\frac{\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi))$

Exact result:

$1 - e^{2\pi}$

Decimal approximation:

-534.4916555247647365030493295890471814778057976032949155 07...

-534.49165…

Property:

$1 - e^{2\pi}$ is a transcendental number

Alternate form:

$-(e^{\pi} - 1)(1 + e^{\pi})$

Series representations:

$$\exp\left(-\frac{2\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi)) = 1 - e^{8\sum_{k=0}^{\infty}(-1)^k/(1+2k)}$$

$$\exp\left(-\frac{2\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi)) = 1 - \left(\sum_{k=0}^{\infty}\frac{1}{k!}\right)^{2\pi}$$

$$\exp\left(-\frac{2\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi)) = 1 - \left(\frac{1}{\sum_{k=0}^{\infty}\frac{(-1)^k}{k!}}\right)^{2\pi}$$

Integral representations:

$$\exp\left(-\frac{2\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi)) = 1 - e^{8\int_0^1\sqrt{1-t^2}\,dt}$$

$$\exp\left(-\frac{2\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi)) = 1 - e^{4\int_0^1 1/\sqrt{1-t^2}\,dt}$$

$$\exp\left(-\frac{2\pi}{24}\right)\exp\left(\frac{\pi}{12}\right)(1-\exp(2\pi)) = 1 - e^{4\int_0^{\infty} 1/(1+t^2)\,dt}$$

Theorem 5.2 (p. 51). *For $f(-q)$ and $R(q)$ defined by (1.6) and (1.4), respectively,*

$$\begin{aligned} R(q) &= \left(\frac{f^{15}(-q)}{f^3(-q^5)} - 500qf^9(-q)f^3(-q^5) - 15625q^2f^3(-q)f^9(-q^5)\right) \\ &\quad\times\sqrt{1+22q\frac{f^6(-q^5)}{f^6(-q)}+125q^2\frac{f^{12}(-q^5)}{f^{12}(-q)}} \end{aligned}$$

and

$$\begin{aligned} R(q^5) &= \left(\frac{f^{15}(-q)}{f^3(-q^5)} + 4qf^9(-q)f^3(-q^5) - q^2f^3(-q)f^9(-q^5)\right) \\ &\quad\times\sqrt{1+22q\frac{f^6(-q^5)}{f^6(-q)}+125q^2\frac{f^{12}(-q^5)}{f^{12}(-q)}}. \end{aligned}$$

(((f^15(-q))/((f^3(-q^5)))+4(exp(2Pi))f^9(-q)f^3(-q^5)-(exp(2Pi))^2*f^3(-q)f^9(-q^5)))*((((1+22*(exp(2Pi))*((f^6(-q^5)))/((f^6(-q)))+125(exp(2Pi))^2*((f^12(-q^5)))/((f^12(-q)))))))^1/2

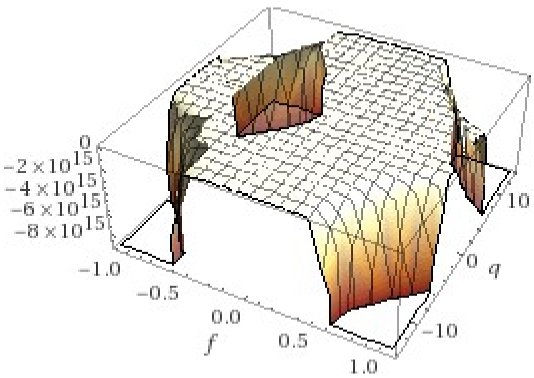
Input:

$$\left(\frac{f^{15}(-q)}{f^3(-q^5)} + 4\exp(2\pi) f^9(-q) f^3(-q^5) - \exp^2(2\pi) f^3(-q) f^9(-q^5)\right) \sqrt{1 + 22\exp(2\pi) \times \frac{f^6(-q^5)}{f^6(-q)} + 125\exp^2(2\pi) \times \frac{f^{12}(-q^5)}{f^{12}(-q)}}$$

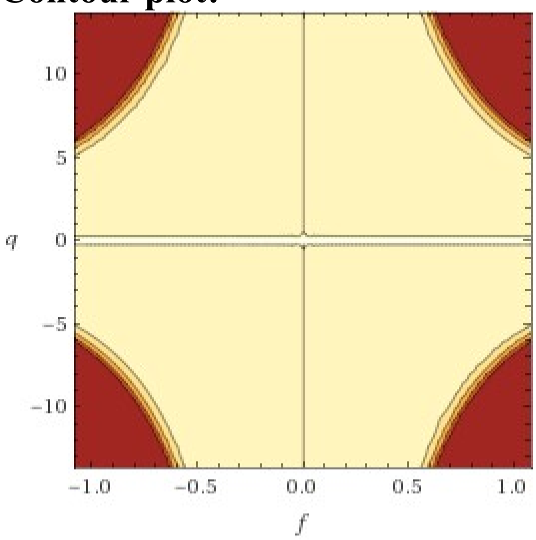
Exact result:

$$\sqrt{125 e^{4\pi} q^4 + 22 e^{2\pi} q^4 + 1} \left(-e^{4\pi} f^{12} q^6 + 4 e^{2\pi} f^{12} q^6 + \frac{f^{12}}{q^4}\right)$$

3D plot:



Contour plot:



Alternate forms:

$$-\frac{f^{12}\sqrt{e^{2\pi}\left(22+125\,e^{2\pi}\right)q^4+1}\;\left(e^{2\pi}\left(e^{2\pi}-4\right)q^{10}-1\right)}{q^4}$$

$$\frac{f^{12}\sqrt{\left(22\,e^{2\pi}+125\,e^{4\pi}\right)q^4+1}\;\left(\left(4\,e^{2\pi}-e^{4\pi}\right)q^{10}+1\right)}{q^4}$$

$$\frac{f^{12}\sqrt{125\,e^{4\pi}\,q^4+22\,e^{2\pi}\,q^4+1}}{q^4}-e^{4\pi}\,f^{12}\,q^6\sqrt{125\,e^{4\pi}\,q^4+22\,e^{2\pi}\,q^4+1}+$$
$$4\,e^{2\pi}\,f^{12}\,q^6\sqrt{125\,e^{4\pi}\,q^4+22\,e^{2\pi}\,q^4+1}$$

Roots:

$f \neq 0\,,\quad q \approx -0.284823$

$f \neq 0\,,\quad q \approx 0.284823$

$f \neq 0\,,\quad q \approx -0.230427 - 0.167415\,i$

$f \neq 0\,,\quad q \approx 0.230427 + 0.167415\,i$

$f \neq 0\,,\quad q \approx -0.0880152 - 0.270883\,i$

Property as a function:

Parity

even

Roots for the variable q:

$$q = -i\,e^{-\pi/2}\sqrt[4]{-\frac{1}{22+125\,e^{2\pi}}}$$

$$q = i\,e^{-\pi/2}\sqrt[4]{-\frac{1}{22+125\,e^{2\pi}}}$$

Series expansion at q = 0:

$$\frac{f^{12}}{q^4}+\frac{1}{2}\,e^{2\pi}\left(22+125\,e^{2\pi}\right)f^{12}+O\!\left(q^2\right)$$

(Laurent series)

Series expansion at q = ∞:

$$-e^{3\pi}\left(e^{2\pi}-4\right)\sqrt{22+125\,e^{2\pi}}\;f^{12}\,q^{8}-\frac{\left(e^{\pi}\left(e^{2\pi}-4\right)f^{12}\right)q^{4}}{2\sqrt{22+125\,e^{2\pi}}}+\frac{e^{-\pi}\left(e^{2\pi}-4\right)f^{12}}{8\left(22+125\,e^{2\pi}\right)^{3/2}}+O\left(\left(\frac{1}{q}\right)^{2}\right)$$

(Taylor series)

Derivative:

$$\frac{\partial}{\partial q}\left(\left(\frac{f^{15}(-q)}{f^{3}(-q^{5})}+4\exp(2\pi)f^{9}(-q)f^{3}(-q^{5})-\exp^{2}(2\pi)f^{3}(-q)f^{9}(-q^{5})\right)\sqrt{1+\frac{22\exp(2\pi)\left(f^{6}(-q^{5})\right)}{f^{6}(-q)}+\frac{125\exp^{2}(2\pi)\left(f^{12}(-q^{5})\right)}{f^{12}(-q)}}\right)=$$
$$-\left(\left(2f^{12}\left(500\,e^{8\pi}q^{14}-1912\,e^{6\pi}q^{14}-2\,e^{2\pi}\left(6q^{6}-11\right)q^{4}+e^{4\pi}\left(-352\,q^{10}+3q^{6}+125\right)q^{4}+2\right)\right)\Big/\left(q^{5}\sqrt{125\,e^{4\pi}q^{4}+22\,e^{2\pi}q^{4}+1}\right)\right)$$

Indefinite integral:

$$\int\left(\frac{f^{15}(-q)}{f^{3}(-q^{5})}+4\exp(2\pi)f^{9}(-q)f^{3}(-q^{5})-\exp^{2}(2\pi)f^{3}(-q)f^{9}(-q^{5})\right)\sqrt{1+\frac{22\exp(2\pi)\left(f^{6}(-q^{5})\right)}{f^{6}(-q)}+\frac{125\exp^{2}(2\pi)\left(f^{12}(-q^{5})\right)}{f^{12}(-q)}}\,dq=$$
$$-\frac{1}{45}f^{12}\left(\frac{1}{\left(22+125\,e^{2\pi}\right)q^{3}}\sqrt{125\,e^{4\pi}q^{4}+22\,e^{2\pi}q^{4}+1}\left(5\,e^{2\pi}\left(e^{2\pi}-4\right)\left(22+125\,e^{2\pi}\right)q^{10}+2\left(e^{2\pi}-4\right)q^{6}+1875\,e^{2\pi}+330\right)+\right.$$
$$\frac{1}{\left(22+125\,e^{2\pi}\right)^{7/4}}\,6\sqrt[4]{-1}\;e^{-(3\pi)/2}\left(\left(4-e^{2\pi}+2420\,i\,e^{3\pi}\sqrt{22+125\,e^{2\pi}}+27500\,i\,e^{5\pi}\sqrt{22+125\,e^{2\pi}}+78125\,i\,e^{7\pi}\sqrt{22+125\,e^{2\pi}}\right)\right.$$
$$F\left(\sin^{-1}\left(\frac{(1+i)\,e^{\pi/2}\sqrt[4]{22+125\,e^{2\pi}}\;q}{\sqrt{2}}\right)\middle|-1\right)+$$
$$e^{2\pi}E\left(\sin^{-1}\left(\frac{(1+i)\,e^{\pi/2}\sqrt[4]{22+125\,e^{2\pi}}\;q}{\sqrt{2}}\right)\middle|-1\right)+$$
$$\left.\left.4E\left(i\sinh^{-1}\left((-1)^{3/4}\sqrt[4]{22\,e^{2\pi}+125\,e^{4\pi}}\;q\right)\middle|-1\right)\right)\right)+\text{constant}$$

From:

$$\sqrt{125 e^{4\pi} q^4 + 22 e^{2\pi} q^4 + 1} \left(-e^{4\pi} f^{12} q^6 + 4 e^{2\pi} f^{12} q^6 + \frac{f^{12}}{q^4}\right)$$

That is

$$\sqrt{1 + 22 e^{2\pi} q^4 + 125 e^{4\pi} q^4} \left(\frac{f^{12}}{q^4} + 4 e^{2\pi} f^{12} q^6 - e^{4\pi} f^{12} q^6\right)$$

And

$f \neq 0, \quad q \approx 0.284823$

For q = 0.284823, from:

sqrt(1 + 22 e^(2 π) q^4 + 125 e^(4 π) q^4) (f^12/q^4 + 4 e^(2 π) f^12 q^6 - e^(4 π) f^12 q^6)   we obtain:

sqrt(1 + 22 e^(2 π) (0.284823)^4 + 125 e^(4 π) (0.284823)^4) (f^12/(0.284823)^4 + 4 e^(2 π) f^12 (0.284823)^6 - e^(4 π) f^12 (0.284823)^6)

Input interpretation:

$$\sqrt{1 + 22 e^{2\pi} \times 0.284823^4 + 125 e^{4\pi} \times 0.284823^4} \left(\frac{f^{12}}{0.284823^4} + 4 e^{2\pi} f^{12} \times 0.284823^6 - e^{4\pi} f^{12} \times 0.284823^6\right)$$

Result:

$0.0470778 f^{12}$

$0.0470778 f^{12}$

That for f = -534.49165, is equal to:

0.0470778 (-534.49165)^12

Input interpretation:

$0.0470778 (-534.49165)^{12}$

Result:

$2.5592178634676176508896726960595551305439035049149722... \times 10^{31}$

Repeating decimal:

$2.5592178634676176508896726960595551305439035049149722... \times 10^{31}$

$2.5592178634676...*10^{31}$

Note that:

sqrt(1 + 22 e^(2 π) (0.284823)^4 + 125 e^(4 π) (0.284823)^4) ((-534.49165)^12/(0.284823)^4 + 4 e^(2 π) (-534.49165)^12 (0.284823)^6 - e^(4 π) (-534.49165)^12 (0.284823)^6)

Input interpretation:

$$\sqrt{1+22 e^{2\pi}\times 0.284823^4+125 e^{4\pi}\times 0.284823^4}\left(\frac{(-534.49165)^{12}}{0.284823^4}+4 e^{2\pi}(-534.49165)^{12}\times 0.284823^6-e^{4\pi}(-534.49165)^{12}\times 0.284823^6\right)$$

Result:

$$2.55922\ldots\times 10^{31}$$

$2.55922\ldots*10^{31}$

Series representations:

$$\sqrt{1+22 e^{2\pi}\,0.284823^4+125 e^{4\pi}\,0.284823^4}\left(\frac{(-534.492)^{12}}{0.284823^4}+4 e^{2\pi}(-534.492)^{12}\,0.284823^6-e^{4\pi}(-534.492)^{12}\,0.284823^6\right)=\left(8.26021\times 10^{34}+1.16092\times 10^{30}\,e^{2\pi}-2.90229\times 10^{29}\,e^{4\pi}\right)\sqrt{0.144785\,e^{2\pi}+0.822641\,e^{4\pi}}\sum_{k=0}^{\infty}\left(0.144785\,e^{2\pi}+0.822641\,e^{4\pi}\right)^{-k}\binom{\frac{1}{2}}{k}$$

$$\sqrt{1+22 e^{2\pi}\,0.284823^4+125 e^{4\pi}\,0.284823^4}\left(\frac{(-534.492)^{12}}{0.284823^4}+4 e^{2\pi}(-534.492)^{12}\,0.284823^6-e^{4\pi}(-534.492)^{12}\,0.284823^6\right)=\left(8.26021\times 10^{34}+1.16092\times 10^{30}\,e^{2\pi}-2.90229\times 10^{29}\,e^{4\pi}\right)\sqrt{0.144785\,e^{2\pi}+0.822641\,e^{4\pi}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(0.144785\,e^{2\pi}+0.822641\,e^{4\pi}\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{1+22\,e^{2\pi}\,0.284823^4+125\,e^{4\pi}\,0.284823^4}\left(\frac{(-534.492)^{12}}{0.284823^4}+4\,e^{2\pi}\,(-534.492)^{12}\,0.284823^6-e^{4\pi}\,(-534.492)^{12}\,0.284823^6\right)=$$

$$(8.26021\times10^{34}+1.16092\times10^{30}\,e^{2\pi}-2.90229\times10^{29}\,e^{4\pi})\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(1+0.144785\,e^{2\pi}+0.822641\,e^{4\pi}-z_0\right)^k z_0^{-k}}{k!}$$

$$\text{for not }((z_0\in\mathbb{R}\text{ and }-\infty<z_0\le0))$$

And:

1/((((((sqrt(1 + 22 e^(2 π) (0.284823)^4 + 125 e^(4 π) (0.284823)^4) ((-534.49165)^12/(0.284823)^4 + 4 e^(2 π) (-534.49165)^12 (0.284823)^6 - e^(4 π) (-534.49165)^12 (0.284823)^6)))))))^1/4096

Input interpretation:

$$1\Bigg/\left(\left(\sqrt{1+22\,e^{2\pi}\times0.284823^4+125\,e^{4\pi}\times0.284823^4}\left(\frac{(-534.49165)^{12}}{0.284823^4}+4\,e^{2\pi}\,(-534.49165)^{12}\times0.284823^6-e^{4\pi}\,(-534.49165)^{12}\times0.284823^6\right)\right)\wedge(1/4096)\right)$$

Result:

0.982498746896829546200460279240084068091396267259958496391...

0.98249874689… result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243}=\boldsymbol{\phi}$

Series representations:

$$1 \Big/ \left(\left(\sqrt{1 + 22\,e^{2\pi}\,0.284823^4 + 125\,e^{4\pi}\,0.284823^4}\left(\frac{(-534.492)^{12}}{0.284823^4} + 4\,e^{2\pi}\,(-534.492)^{12}\,0.284823^6 - e^{4\pi}\,(-534.492)^{12}\,0.284823^6\right)\right)\hat{}\,(1/4096)\right) =$$

$$1 \Big/ \left(\left((8.26021\times10^{34} + 1.16092\times10^{30}\,e^{2\pi} - 2.90229\times10^{29}\,e^{4\pi})\sqrt{0.144785\,e^{2\pi} + 0.822641\,e^{4\pi}}\sum_{k=0}^{\infty}(0.144785\,e^{2\pi} + 0.822641\,e^{4\pi})^{-k}\binom{\frac{1}{2}}{k}\right)\hat{}\,(1/4096)\right)$$

$$1 \Big/ \left(\left(\sqrt{1 + 22\,e^{2\pi}\,0.284823^4 + 125\,e^{4\pi}\,0.284823^4}\left(\frac{(-534.492)^{12}}{0.284823^4} + 4\,e^{2\pi}\,(-534.492)^{12}\,0.284823^6 - e^{4\pi}\,(-534.492)^{12}\,0.284823^6\right)\right)\hat{}\,(1/4096)\right) =$$

$$1 \Big/ \left(\left((8.26021\times10^{34} + 1.16092\times10^{30}\,e^{2\pi} - 2.90229\times10^{29}\,e^{4\pi})\sqrt{0.144785\,e^{2\pi} + 0.822641\,e^{4\pi}}\sum_{k=0}^{\infty}\frac{(-1)^k\,(0.144785\,e^{2\pi} + 0.822641\,e^{4\pi})^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\hat{}\,(1/4096)\right)$$

$$1 \Big/ \left(\left(\sqrt{1 + 22\,e^{2\pi}\,0.284823^4 + 125\,e^{4\pi}\,0.284823^4}\left(\frac{(-534.492)^{12}}{0.284823^4} + 4\,e^{2\pi}\,(-534.492)^{12}\,0.284823^6 - e^{4\pi}\,(-534.492)^{12}\,0.284823^6\right)\right)\hat{}\,(1/4096)\right) =$$

$$1 \Big/ \left(\left((8.26021\times10^{34} + 1.16092\times10^{30}\,e^{2\pi} - 2.90229\times10^{29}\,e^{4\pi})\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(1 + 0.144785\,e^{2\pi} + 0.822641\,e^{4\pi} - z_0)^k\,z_0^{-k}}{k!}\right)\hat{}\,(1/4096)\right) \text{ for not } ((z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$$

Further, we have that:

sqrt(1 + 22 e^(2 π) (0.284823)^4 + x e^(4 π) (0.284823)^4) (f^12/(0.284823)^4 + 4 e^(2 π) f^12 (0.284823)^6 - e^(4 π) f^12 (0.284823)^6) = 0.0470778 f^12

Input interpretation:

$$\sqrt{1 + 22 e^{2\pi} \times 0.284823^4 + x e^{4\pi} \times 0.284823^4} \left(\frac{f^{12}}{0.284823^4} + 4 e^{2\pi} f^{12} \times 0.284823^6 - e^{4\pi} f^{12} \times 0.284823^6\right) = 0.0470778 f^{12}$$

Result:

$$0.0000969138 f^{12} \sqrt{1887.15 x + 78.531} = 0.0470778 f^{12}$$

Alternate form assuming f and x are real:

$$f \sqrt{1887.15 x + 78.531} = 485.77 f$$

Alternate form:

$$f^{12} \sqrt{1887.15 x + 78.531} = 485.77 f^{12}$$

Alternate form assuming f and x are positive:

$$\sqrt{1887.15 x + 78.531} = 485.77$$

Solutions:

$$f \neq 0, \quad x \approx 125.$$

$$f = 0$$

Solution for the variable x:

$$x \approx 125.$$

$x = 125$ result practically equal to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

Implicit derivatives:

$$\frac{\partial f(x)}{\partial x} = (4788909602547610807923293531250000000000 f)/(7183374416380803942089515304626796709576869 - 57466915230571329695079522375000000000000 x)$$

$$\frac{\partial x(f)}{\partial f} = \frac{\frac{7183374416380803942089515304626796709576869}{4788909602547610807923293531250000000000} - 12 x}{f}$$

Thence, we have:

$$R(q^5) = \left(\frac{f^{15}(-q)}{f^3(-q^5)} + 4qf^9(-q)f^3(-q^5) - q^2f^3(-q)f^9(-q^5)\right)$$
$$\times\sqrt{1+22q\frac{f^6(-q^5)}{f^6(-q)}+125q^2\frac{f^{12}(-q^5)}{f^{12}(-q)}}.$$

$$\sqrt{1+22\,e^{2\pi}\times 0.284823^4+x\,e^{4\pi}\times 0.284823^4}$$
$$\left(\frac{f^{12}}{0.284823^4}+4\,e^{2\pi}\,f^{12}\times 0.284823^6-e^{4\pi}\,f^{12}\times 0.284823^6\right)=0.0470778\,f^{12}$$

$$0.0000969138\,f^{12}\sqrt{1887.15\,x+78.531}=0.0470778\,f^{12}$$

$x = 125$ result practically equal to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

Now, we have that:

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CONTINUED FRACTIONS AND MODULAR FUNCTIONS

W. DUKE

Theorem 2. *If τ is in an imaginary quadratic field, then $r(\tau)$ is a unit that can be expressed in terms of radicals over $\mathbb{Q}$.*

Perhaps this provides a satisfactory interpretation of Ramanujan's general claim about $r(\frac{1}{2}\sqrt{-n})$. For τ imaginary quadratic, (2.5) reduces the evaluation of $r(\tau)$ to a machine calculation. Thus $r(i)$ from (2.3) is a root of the factor $r^4+2r^3-6r^2-2r+1$ of (2.5) when $j(i)=1728$. As another example we have

$$\frac{e^{\frac{-\pi\sqrt{19}}{5}}}{1-}\,\frac{e^{-\pi\sqrt{19}}}{1+}\,\frac{e^{-2\pi\sqrt{19}}}{1-}\,\frac{e^{-3\pi\sqrt{19}}}{1+}\cdots$$
$$=\frac{-8-3\sqrt{5}-\sqrt{125+60\sqrt{5}}+\sqrt{250+108\sqrt{5}+(16+6\sqrt{5})\sqrt{125+60\sqrt{5}}}}{4},$$

which comes from solving (2.5) when $j(\frac{-1+\sqrt{19}}{2})=-2^{15}3^3$. The only limitations to evaluating $r(\tau)$ for τ imaginary quadratic are one's software and patience, since $j(\tau)$ is explicitly computable. On the other hand, if τ has $j(\tau)=1$, say, then $r(\tau)$ is a unit but it is not expressible in terms of radicals over $\mathbb{Q}$.

1/4[-8-3sqrt(5)-sqrt(125+60sqrt(5))+sqrt(((((250+108sqrt(5)+(16+6sqrt(5))(125+60sqrt(5))^1/2))))]

Input:

$$\frac{1}{4}\left(-8-3\sqrt{5}-\sqrt{125+60\sqrt{5}}+\sqrt{250+108\sqrt{5}+\left(16+6\sqrt{5}\right)\sqrt{125+60\sqrt{5}}}\right)$$

Decimal approximation:

0.064649439056535103241513776846661973887002699494301776276...

0.06464943905653510….

Alternate forms:

$$\frac{1}{4}\left(-\sqrt{5\left(25+12\sqrt{5}\right)}-3\sqrt{5}+\sqrt{30\sqrt{25+12\sqrt{5}}+108\sqrt{5}+16\sqrt{5\left(25+12\sqrt{5}\right)}+250}-8\right)$$

$$\text{root of } x^8+16x^7+7x^6-22x^5-45x^4+22x^3+7x^2-16x+1 \text{ near } x=0.0646494$$

$$-2-\frac{3\sqrt{5}}{4}-\frac{1}{4}\sqrt{125+60\sqrt{5}}+\frac{1}{4}\sqrt{250+108\sqrt{5}+\left(16+6\sqrt{5}\right)\sqrt{125+60\sqrt{5}}}$$

Minimal polynomial:

$$x^8+16x^7+7x^6-22x^5-45x^4+22x^3+7x^2-16x+1$$

We have:

((((((((((1/4(((-8-3sqrt(5)-sqrt(125+60sqrt(5))+sqrt(((((250+108sqrt(5)+(16+6sqrt(5))(125+60sqrt(5))^1/2)))))))))))))))))))^1/1024

Input:

$$\left(\frac{1}{4}\left(-8-3\sqrt{5}-\sqrt{125+60\sqrt{5}}+\sqrt{250+108\sqrt{5}+\left(16+6\sqrt{5}\right)\sqrt{125+60\sqrt{5}}}\right)\right)^{\wedge}(1/1024)$$

Result:

$$\frac{\sqrt[1024]{-8-3\sqrt{5}-\sqrt{125+60\sqrt{5}}+\sqrt{250+108\sqrt{5}+(16+6\sqrt{5})\sqrt{125+60\sqrt{5}}}}}{\sqrt[512]{2}}$$

Decimal approximation:

0.997328987726547058231294756459009643122800069039608291082...

0.997328987765…. result very near to the value of the following Rogers-Ramanujan continued fraction:

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

and to the dilaton value $\mathbf{0.989117352243 = \phi}$

Alternate forms:

$$\frac{1}{2}\left(-\sqrt{5\left(25+12\sqrt{5}\right)}-3\sqrt{5}+\sqrt{30\sqrt{25+12\sqrt{5}}+108\sqrt{5}+16\sqrt{5\left(25+12\sqrt{5}\right)}+250}-8\right)\text{^}(1/1024)\,2^{511/512}$$

$$\frac{1}{\sqrt[512]{2}}\left(\left(-8-3\sqrt{5}-\sqrt{5\left(25+12\sqrt{5}\right)}+\sqrt{2\left(125+54\sqrt{5}+15\sqrt{25+12\sqrt{5}}+8\sqrt{5\left(25+12\sqrt{5}\right)}\right)}\right)\text{^}(1/1024)\right)$$

$$\frac{1}{2^{5/2048}}\left(\left(-\sqrt{125-5\,i\sqrt{95}}-\sqrt{2}\left(8+3\sqrt{5}+\sqrt{\frac{5}{2}\,i\left(\sqrt{95}+-25\,i\right)}\right)+2^{3/4}\sqrt{\left(\left(8+3\sqrt{5}\right)\sqrt{125-5\,i\sqrt{95}}+\sqrt{2}\left(125+54\sqrt{5}+\left(8+3\sqrt{5}\right)\sqrt{\frac{5}{2}\,i\left(\sqrt{95}+-25\,i\right)}\right)\right)}\right)\text{^}(1/1024)\right)$$

And:

0.064649439056 = 1/4[-8-3sqrt(5)-sqrt(x+60sqrt(5))+sqrt(((((250+108sqrt(5)+(16+6sqrt(5)) (x+60sqrt(5))^1/2))))]

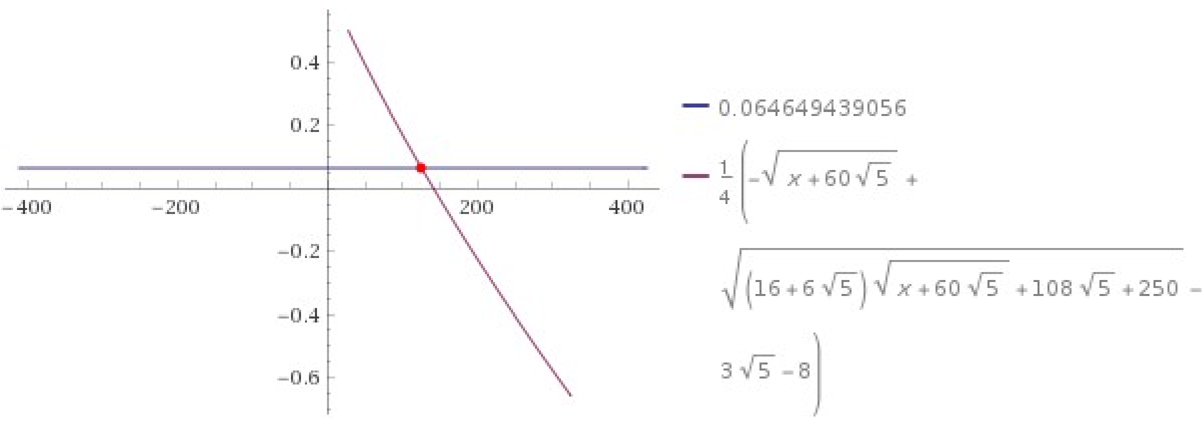
Input interpretation:

$$0.064649439056 = \frac{1}{4}\left(-8-3\sqrt{5}-\sqrt{x+60\sqrt{5}}+\sqrt{250+108\sqrt{5}+\left(16+6\sqrt{5}\right)\sqrt{x+60\sqrt{5}}}\right)$$

Result:

$$0.064649439056 = \frac{1}{4}\left(-\sqrt{x+60\sqrt{5}}+\sqrt{\left(16+6\sqrt{5}\right)\sqrt{x+60\sqrt{5}}+108\sqrt{5}+250}-3\sqrt{5}-8\right)$$

Plot:



Alternate form:

$$0.064649439056 = \frac{1}{4}\left(-\sqrt{x+60\sqrt{5}} + \sqrt{2}\sqrt{3\sqrt{5}\sqrt{x+60\sqrt{5}} + 8\sqrt{x+60\sqrt{5}} + 54\sqrt{5} + 125} - 3\sqrt{5} - 8\right)$$

Expanded form:

$$0.064649439056 = -\frac{1}{4}\sqrt{x+60\sqrt{5}} + \frac{1}{4}\sqrt{\left(16+6\sqrt{5}\right)\sqrt{x+60\sqrt{5}} + 108\sqrt{5} + 250} - \frac{3\sqrt{5}}{4} - 2$$

Solution:

$x \approx 125.00000000013725$

$x = 125$ result practically equal to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

From:

Introduzione alla cosmologia

Marco M. Caldarelli

Mathematical Sciences and STAG Research Centre, University of Southampton, United Kingdom - Aprile 2016

arXiv:1611.09227v1 [gr-qc] 25 Nov 2016

Now, we have that:

Note in Italian

In questa sezione poniamo $\hbar = 1$ e $c = 1$, e definiamo la massa di Planck ridotta

$$M_{\mathrm{P}}^2 = \frac{1}{8\pi G_{\mathrm{N}}}. \tag{6.3}$$

In queste unità, le lunghezze hanno dimensioni di una massa inversa, e l'azione è adimensionale. Utilizzando i valori delle costanti fondamentali, troviamo che $M_{\mathrm{p}} = 2.435 \times 10^{18}\ \mathrm{GeV}/c^2$.

Esempio 2 ***Inflazione con potenziale polinomiale:*** *Consideriamo il potenziale seguente*

$$V(\phi) = \mu^{4-p}\phi^p, \tag{6.28}$$

dove μ è una costante con dimensioni di una massa, e $p > 0$ è l'esponente. L'inflazione termina quando l'inflatone raggiunge il minimo del potenziale, $\phi \approx 0$. Dall'eq. (6.27), il numero di e-foldings è dato dal valore iniziale ϕ_i dell'inflatone,

$$N - -\frac{1}{M_{\mathsf{p}}^2}\int_{\phi_i}^{0}\frac{\phi}{p}d\phi - \frac{1}{2M_{\mathsf{p}}^2}\frac{\phi_i^2}{p}. \tag{6.29}$$

Vediamo dunque che per avere $N \approx 60$ e-foldings, il valore iniziale dell'inflatone deve essere

$$|\phi_i| > M_{\mathsf{p}}\sqrt{2Nn} \approx 15M_{\mathsf{p}}. \tag{6.30}$$

Durante la fase inflazionaria in regime di *slow-roll*, l'evoluzione del fattore di scala è approssimato da un'esponenziale. Tuttavia, mentre il dilatone si avvicina al minimo del potenziale, il valore del potenziale – e dunque della costante cosmologica effettiva Λ_{eff} – diminuisce. Vi sono dunque deviazioni dalla geometria di de Sitter, che comunque approssima bene la geometria dell'universo su periodi in cui Λ_{eff} varia poco.

From the following formula, concerning a Ramanujan mock theta functions:

Input interpretation:

$$1 + 0.449329\,(1 + 0.449329) + 0.449329^3\,(1 + 0.449329)\left(1 + 0.449329^2\right) + 0.44329^6\,(1 + 0.449329)\left(1 + 0.449329^2\right)\left(1 + 0.449329^3\right) =$$

$= 1.823668114519603459609150422857916769816281700020239762302...$

***$\psi(q)$* = 1.8236681145196...**

The initial value of inflaton must be:

$$|\phi_i| > M_{\mathsf{p}}\sqrt{2Nn} \approx 15M_{\mathsf{p}}.$$

For n = **1.8236681145196...** and N = 64, we obtain:

sqrt(2*1.8236681145196*64)

Input interpretation:

$\sqrt{2 \times 1.8236681145196 \times 64}$

Result:

15.278400395935...

15.278400395....

And:

(sqrt(2*1.8236681145196*64)) (2.435*10^18 GeV/c^2)

Input interpretation:

$\sqrt{2 \times 1.8236681145196 \times 64} \times 2.435 \times 10^{18}$ GeV/c^2

Result:

3.72×10^{19} GeV/c^2

$3.7202904964102... \times 10^{19}$

$3.7202904964102... * 10^{19}$

For n = 2 and N = 60, we obtain:

sqrt(2*2*60)

Input:

$\sqrt{2 \times 2 \times 60}$

Result:

$4\sqrt{15}$

Decimal approximation:

15.491933384829667540717061599129598443331686821166363306 35...

15.4919333848....

And:

(sqrt(2*2*60)) (2.435*10^18) GeV/c^2

Input interpretation:

$\sqrt{2\times2\times60}\times2.435\times10^{18}$ GeV/c^2

Result:

3.772×10^{19} GeV/c^2

$3.77228577920602404 6\ldots\times10^{19}$

3.7722857792...*10^{19}

We note that:

(((1/(sqrt(((2*1.8236681145196*64 * 2.435*10^18))))))^1/4096

Input interpretation:

$$\sqrt[4096]{\frac{1}{\sqrt{2\times1.8236681145196\times64\times2.435\times10^{18}}}}$$

Result:

0.994183320825594686...

0.994183320825..... result very near to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}}\approx0.9991104684$$

and to the dilaton value $\mathbf{0.989117352243} = \boldsymbol{\phi}$

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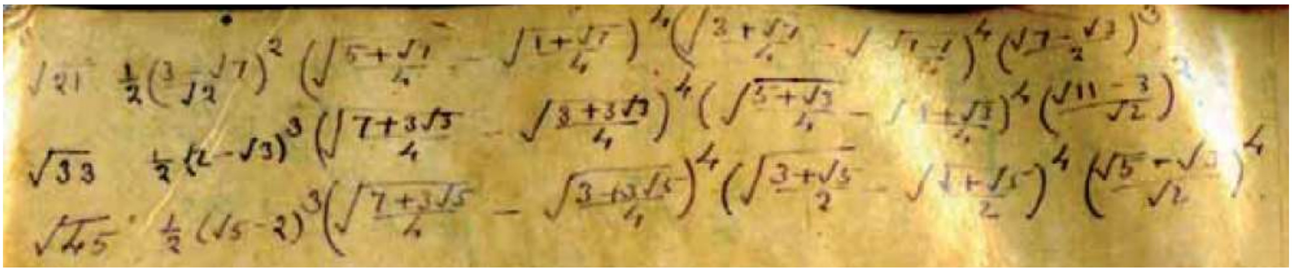


sqrt(33)*1/2(((((2-sqrt(3))))^3*(((((sqrt((7+3sqrt(5))/4))-sqrt((3+3sqrt(3))/4)))))^4

Input:

$$\sqrt{33}\times\frac{1}{2}\left(\left(2-\sqrt{3}\right)^3\left(\sqrt{\frac{1}{4}\left(7+3\sqrt{5}\right)}-\sqrt{\frac{1}{4}\left(3+3\sqrt{3}\right)}\right)^4\right)$$

Exact result:

$$\frac{1}{2}\sqrt{33}\left(2-\sqrt{3}\right)^3\left(\frac{1}{2}\sqrt{7+3\sqrt{5}}-\frac{1}{2}\sqrt{3+3\sqrt{3}}\right)^4$$

Decimal approximation:

0.001715874382788350773907849175069905951090990121179957429...

0.00171587438278……

Alternate forms:

$$-\frac{1}{32}\sqrt{33}\left(\sqrt{3}-2\right)^3\left(\sqrt{3\left(1+\sqrt{3}\right)}-\sqrt{7+3\sqrt{5}}\right)^4$$

$$\frac{1}{2}\sqrt{33}\left(2-\sqrt{3}\right)^3\left(\frac{1}{2}\left(\frac{3}{\sqrt{2}}+\sqrt{\frac{5}{2}}\right)-\frac{1}{2}\sqrt{3+3\sqrt{3}}\right)^4$$

$$-\frac{1}{128}\sqrt{33}\left(\sqrt{3}-2\right)^3\left(-3-\sqrt{5}+\sqrt{3-3\,i\sqrt{2}}+\sqrt{3\,i\left(\sqrt{2}+-i\right)}\right)^4$$

(((((sqrt((5+sqrt(3))/4))-sqrt((((1+sqrt(3))/4))))^4 *((((sqrt(11)-3))/(sqrt(2)))^2

Input:

$$\left(\sqrt{\frac{1}{4}\left(5+\sqrt{3}\right)}-\sqrt{\frac{1}{4}\left(1+\sqrt{3}\right)}\right)^4\left(\frac{\sqrt{11}-3}{\sqrt{2}}\right)^2$$

Result:

$$\frac{1}{2}\left(\sqrt{11}-3\right)^2\left(\frac{\sqrt{5+\sqrt{3}}}{2}-\frac{1}{2}\sqrt{1+\sqrt{3}}\right)^4$$

Decimal approximation:

0.002464005488677292872126290234990000930856734384300851089...

0.002464005488677…

Alternate forms:

$$\frac{1}{16}\left(\sqrt{5+\sqrt{3}}-\sqrt{1+\sqrt{3}}\right)^4\left(10-3\sqrt{11}\right)$$

$$\frac{1}{8}\left(\sqrt{11}-3\right)^2\left(3+\sqrt{3}-\sqrt{8+6\sqrt{3}}\right)^2$$

root of $x^8-400x^7-1988x^6-156400x^5+317638x^4-156400x^3-1988x^2-400x+1$ near $x=0.00246401$

Minimal polynomial:

$$x^8-400x^7-1988x^6-156400x^5+317638x^4-156400x^3-1988x^2-400x+1$$

0.00246400548867729*sqrt(33)*1/2(((((2-sqrt(3))))^3*(((((sqrt((7+3sqrt(5))/4))-sqrt((3+3sqrt(3))/4))))))^4

Input interpretation:

$$0.00246400548867729\sqrt{33}\times\frac{1}{2}\left(\left(2-\sqrt{3}\right)^3\left(\sqrt{\frac{1}{4}\left(7+3\sqrt{5}\right)}-\sqrt{\frac{1}{4}\left(3+3\sqrt{3}\right)}\right)^4\right)$$

Result:

$4.22792389707125... \times 10^{-6}$

4.22792389707125...*10^{-6}

From which:

(2048+768)/((((0.00246400548867729*sqrt(33)*1/2(((((2-sqrt(3))))^3*(((((sqrt((7+3sqrt(5))/4))-sqrt((3+3sqrt(3))/4))))))^4))))))^3

Where 768 = 64*12

Input interpretation:

$$\frac{2048+768}{\left(0.00246400548867729\sqrt{33}\times\frac{1}{2}\left((2-\sqrt{3})^3\left(\sqrt{\frac{1}{4}(7+3\sqrt{5})}-\sqrt{\frac{1}{4}(3+3\sqrt{3})}\right)^4\right)\right)^3}$$

Result:

$3.72607134540968... \times 10^{19}$

$3.7260713454...*10^{19}$

sqrt(21)*1/2(((((3-sqrt(7))/sqrt(2)))))^2*(((((sqrt((5+sqrt(7))/4))-sqrt((1+sqrt(7))/4)))))^4

Input:

$$\sqrt{21}\times\frac{1}{2}\left(\left(\frac{3-\sqrt{7}}{\sqrt{2}}\right)^2\left(\sqrt{\frac{1}{4}\left(5+\sqrt{7}\right)}-\sqrt{\frac{1}{4}\left(1+\sqrt{7}\right)}\right)^4\right)$$

Result:

$$\frac{1}{4}\sqrt{21}\left(3-\sqrt{7}\right)^2\left(\frac{\sqrt{5+\sqrt{7}}}{2}-\frac{1}{2}\sqrt{1+\sqrt{7}}\right)^4$$

Decimal approximation:

0.004817845084995916859784102666153025393501661096519587403...

0.0048178450849959....

Alternate forms:

$$\frac{1}{32}\left(84\sqrt{6\left(5+\sqrt{7}\right)\left(11+5\sqrt{7}\right)}+336\sqrt{3}-112\sqrt{21}-32\sqrt{42\left(5+\sqrt{7}\right)\left(11+5\sqrt{7}\right)}+84\sqrt{6\left(1+\sqrt{7}\right)\left(115+41\sqrt{7}\right)}-32\sqrt{42\left(1+\sqrt{7}\right)\left(115+41\sqrt{7}\right)}\right)$$

$$\frac{1}{4}\sqrt{21}\left(\sqrt{6\sqrt{7}-15}-1\right)^2$$

$$\frac{1}{2}\sqrt{21\left(97-36\sqrt{7}-2\sqrt{42\left(31\sqrt{7}-82\right)}\right)}$$

Minimal polynomial:

$$256 x^8 - 521472 x^6 + 464722272 x^4 - 8378611920 x^2 + 194481$$

(((((sqrt((3+sqrt(7))/4))-sqrt((((sqrt(7)-1))/4))))^4 *((((sqrt(7)-sqrt(3))1/2)))^3

Input:

$$\left(\sqrt{\frac{1}{4}\left(3+\sqrt{7}\right)} - \sqrt{\frac{1}{4}\left(\sqrt{7}-1\right)}\right)^4 \left(\left(\sqrt{7}-\sqrt{3}\right)\times\frac{1}{2}\right)^3$$

Result:

$$\frac{1}{8}\left(\sqrt{7}-\sqrt{3}\right)^3 \left(\frac{\sqrt{3+\sqrt{7}}}{2} - \frac{1}{2}\sqrt{\sqrt{7}-1}\right)^4$$

Decimal approximation:

0.008511712333430479974160263784561278414660927708601493678...

0.00851171233343…

Alternate forms:

$$\frac{1}{16}\left(\sqrt{3+\sqrt{7}} - \sqrt{\sqrt{7}-1}\right)^4 \left(2\sqrt{7} - 3\sqrt{3}\right)$$

$$\left(3\sqrt{3} - 2\sqrt{7}\right)\left(-3-\sqrt{7}+\sqrt{15+6\sqrt{7}}\right)$$

$$-\frac{1}{128}\left(\sqrt{3}-\sqrt{7}\right)^3 \left(\sqrt{\sqrt{7}-1} - \sqrt{3+\sqrt{7}}\right)^4$$

Minimal polynomial:

$$x^8 - 112 x^7 - 548 x^6 - 11536 x^5 + 24454 x^4 - 11536 x^3 - 548 x^2 - 112 x + 1$$

0.008511712333430479974160263784561278414660927708601493678*sqrt(21)*1/2(((((3-sqrt(7))/sqrt(2)))))^2*(((((sqrt((5+sqrt(7))/4))-sqrt((1+sqrt(7))/4)))))^4

Input interpretation:

$$0.008511712333430479974160263784561278414660927708601493678 \sqrt{21}\times\frac{1}{2}\left(\left(\frac{3-\sqrt{7}}{\sqrt{2}}\right)^2 \left(\sqrt{\frac{1}{4}\left(5+\sqrt{7}\right)} - \sqrt{\frac{1}{4}\left(1+\sqrt{7}\right)}\right)^4\right)$$

Result:

0.0000410081114305171646177641745474903097803560003029289 84...

0.0000410081114305171646..... final result

We observe that:

89/(((((0.008511712333430479974 16*sqrt(21)*1/2(((((3-sqrt(7))/sqrt(2)))))^2*(((((sqrt((5+sqrt(7))/4))-sqrt((1+sqrt(7))/4)))))^4)))))))^4

Input interpretation:

$$89 \Big/ \left(0.0085117123334304799 7416 \sqrt{21} \times \frac{1}{2}\left(\left(\frac{3-\sqrt{7}}{\sqrt{2}}\right)^2 \left(\sqrt{\frac{1}{4}\left(5+\sqrt{7}\right)} - \sqrt{\frac{1}{4}\left(1+\sqrt{7}\right)}\right)^4\right)\right)^4$$

Result:

$3.1471028110187284183... \times 10^{19}$

$3.1471028110187284...*10^{19}$

Now:

sqrt(45)*1/2((((sqrt(5)-2)))))^3*(((((sqrt((7+3sqrt(5))/4))-sqrt((3+3sqrt(5))/4)))))^4

Input:

$$\sqrt{45} \times \frac{1}{2}\left(\left(\sqrt{5}-2\right)^3 \left(\sqrt{\frac{1}{4}\left(7+3\sqrt{5}\right)} - \sqrt{\frac{1}{4}\left(3+3\sqrt{5}\right)}\right)^4\right)$$

Result:

$$\frac{3}{2}\sqrt{5}\left(\sqrt{5}-2\right)^3 \left(\frac{1}{2}\sqrt{7+3\sqrt{5}} - \frac{1}{2}\sqrt{3+3\sqrt{5}}\right)^4$$

Decimal approximation:

0.000326673340126800885618830680216848620021456742544018020...

0.0003266733401268……

Alternate forms:

$$\frac{1}{512}\left(-640\sqrt{6\left(1+\sqrt{5}\right)} - 4352\sqrt{5} + 256\sqrt{30\left(1+\sqrt{5}\right)} - 24960\sqrt{3\left(2+\sqrt{5}\right)} + 11136\sqrt{15\left(2+\sqrt{5}\right)} + 10240\right)3$$

$$60 - \frac{51\sqrt{5}}{2} - 15\sqrt{51\sqrt{5}-114}$$

$$\frac{3}{2}\left(40-17\sqrt{5}-10\sqrt{3\left(17\sqrt{5}-38\right)}\right)$$

Minimal polynomial:

$$16x^4-3840x^3+1062360x^2-6199200x+2025$$

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

Input:

$$\left(\sqrt{\frac{1}{2}\left(3+\sqrt{5}\right)}-\sqrt{\frac{1}{2}\left(7+\sqrt{5}\right)}\right)^4\left(\left(\sqrt{5}-\sqrt{3}\right)\times\frac{1}{\sqrt{2}}\right)^4$$

Result:

$$\frac{1}{4}\left(\sqrt{5}-\sqrt{3}\right)^4\left(\sqrt{\frac{1}{2}\left(3+\sqrt{5}\right)}-\sqrt{\frac{1}{2}\left(7+\sqrt{5}\right)}\right)^4$$

Decimal approximation:

0.001281920468199085376747119848978226936831564310415456506...

0.0012819204681….

Alternate forms:

$$\frac{1}{16}\left(-\sqrt{2\left(7+\sqrt{5}\right)}+\sqrt{5}+1\right)^4\left(31-8\sqrt{15}\right)$$

$$-\frac{1}{16}\left(8\sqrt{15}-31\right)\left(1+\sqrt{5}-\sqrt{2\left(7+\sqrt{5}\right)}\right)^4$$

$$-\frac{1}{16}\left(8\sqrt{15}-31\right)\left(\sqrt{2\left(3+\sqrt{5}\right)}-\sqrt{2\left(7+\sqrt{5}\right)}\right)^4$$

Minimal polynomial:

$$x^8-13888x^7+17631168x^6-917052416x^5+6884165120x^4-14672838656x^3+4513579008x^2-56885248x+65536$$

0.0003266733401268* (((((sqrt((3+sqrt(5))/2))-sqrt((((7+sqrt(5))/2))))^4 *((((sqrt(5)-sqrt(3))1/(sqrt(2))))^4

Input interpretation:

$$0.0003266733401268\left(\left(\sqrt{\frac{1}{2}\left(3+\sqrt{5}\right)}-\sqrt{\frac{1}{2}\left(7+\sqrt{5}\right)}\right)^4\left(\left(\sqrt{5}-\sqrt{3}\right)\times\frac{1}{\sqrt{2}}\right)^4\right)$$

Result:

$4.187692411235... \times 10^{-7}$

4.187692411235...*10^{-7}

From which, we obtain:

e/((((((((((0.0003266733401268*(((((sqrt((3+sqrt(5))/2))-sqrt((((7+sqrt(5))/2))))^4 *((((sqrt(5)-sqrt(3))1/(sqrt(2))))^4))))))))))))^3

Input interpretation:

$$\frac{e}{\left(0.0003266733401268\left(\left(\sqrt{\frac{1}{2}\left(3+\sqrt{5}\right)}-\sqrt{\frac{1}{2}\left(7+\sqrt{5}\right)}\right)^4\left(\left(\sqrt{5}-\sqrt{3}\right)\times\frac{1}{\sqrt{2}}\right)^4\right)\right)^3}$$

Result:

$3.701435253726... \times 10^{19}$

3.701435253726...*10^{19}

We observe that the three results of the Ramanujan expressions 3.7260713454…*10^{19} ; 3.1471028110187284…*10^{19} and 3.701435253726...*10^{19} , are very near to the initial values of inflaton: 3.7202904964102…*10^{19} and 3.7722857792...*10^{19}. The results highlighted in red are the closest ones.

With regard the number 125 and the dilaton mass, we have that:

From:

Dilaton Chiral Perturbation Theory – Determining Mass and Decay Constant of Technidilaton on the Lattice (*KMI International Symposium 2013 on Quest for the Origin of Particles and the Universe", 11-13 December, 2013 Nagoya University, Japan)*

Shinya Matsuzaki
Institute for Advanced Research & Department of Physics, Nagoya University, Nagoya - 464-8602, Japan
Koichi Yamawaki
Kobayashi-Maskawa Institute for the Origin of Particles and the Universe (KMI), Nagoya University, Nagoya 464-8602, Japan

We have the following equations:

$$\mathscr{L}_{(2)}^{\text{inv}} = \frac{F_\phi^2}{2}(\partial_\mu \chi)^2 + \frac{F_\pi^2}{4}\chi^2 \text{tr}[\partial_\mu U^\dagger \partial^\mu U]\,. \tag{2}$$

$$\mathscr{L}_{(2)\text{hard}}^{S} = -\frac{F_\phi^2}{4} m_\phi^2 \chi^4 \left(\log\frac{\chi}{S} - \frac{1}{4}\right). \tag{3}$$

$$\mathscr{L}_{(2)\text{soft}}^{S} = \frac{F_\pi^2}{4}\left(\frac{\chi}{S}\right)^{3-\gamma_m} \cdot S^4 \text{tr}[\mathscr{M}^\dagger U + U^\dagger \mathscr{M}] - \frac{(3-\gamma_m)F_\pi^2}{8}\chi^4 \cdot \left(N_f \text{tr}[\mathscr{M}^\dagger \mathscr{M}]\right)^{1/2}. \tag{4}$$

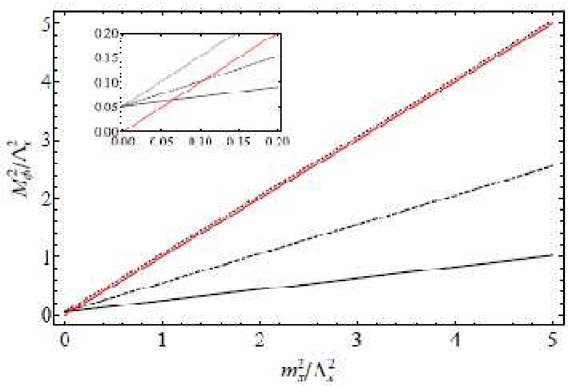


Figure 1: The plot of M_ϕ^2/Λ_χ^2 with respect to $m_\pi^2/\Lambda_\chi^2 (\equiv \mathscr{X})$ obtained from Eq.(5), with $N_f = 8$ and $F_\pi = 123$ GeV and the chiral-limit dilaton mass $m_\phi - 125$ GeV. The slope $s \simeq r = 2N_f F_\pi^2/F_\phi^2$ in Eq.(5) as been taken to be 0.2 (solid black), 0.5 (dashed black) and 1.0 (dotted black). The solid red line corresponds to $M_\phi^2 - m_\pi^2$.

The scale and chiral invariant Lagrangian at the leading order $\mathcal{O}(p^2)$ is thus constructed from terms in Eqs.(2), (3) and (4): $\mathscr{L}_{(2)} = \mathscr{L}^{\rm inv}_{(2)} + \mathscr{L}^S_{(2)\rm hard} + \mathscr{L}^S_{(2)\rm soft}$. From this, the dilaton mass reads

$$M_\phi^2 = m_\phi^2 + s \cdot m_\pi^2 , \qquad s \equiv \frac{(3-\gamma_m)(1+\gamma_m)}{4} \cdot \frac{2N_f F_\pi^2}{F_\phi^2} \simeq \frac{2N_f F_\pi^2}{F_\phi^2} \equiv r , \tag{5}$$

where the prefactor $(3-\gamma_m)(1+\gamma_m)/4 = 1-(\delta/2)^2 \simeq 1$ ($\delta \equiv 1-\gamma_m$; $(\delta/2)^2 \ll 1$) is very insensitive to the exact value of γ_m as far as $\gamma_m \simeq 1$ in the walking gauge theory. Equation (5) is our main result. It is useful for determining simultaneously the chiral limit values of both the mass m_ϕ and the decay constant F_ϕ of the flavor-singlet scalar meson as the technidilaton of the walking technicolor on the lattice. Simultaneous fit of the intercept and the slope of the plot of M_ϕ^2 vs m_π^2 by the lattice data would give m_ϕ^2 (intercept) and the F_ϕ through the slope parameter $s \simeq r \equiv \frac{2N_f F_\pi^2}{F_\phi^2}$. Note that r is an N_f-independent quantity, since $F_\phi^2 (\propto N_f)$ is associated with the flavor-singlet operator having sum of N_f flavors contributions, while F_π^2 is not. For a given N_f all the quantities γ_m, F_π, F_ϕ and m_π in the expression of slope parameter s can be measured separately in the lattice simulations on the same set up, and hence measuring s would be a self-consistency check of the simulations.

In Fig. 1 we present plots $(x,y) = (m_\pi^2, M_\phi^2)$ of mock-up data for general case $s \simeq$ r = (0.2, 0.5, 1.0) in the one-family model, $N_f = 8$ (4 weak-doublets) with $F_\pi = v_{\rm EW}/\sqrt{4} \simeq 123$ GeV, by normalizing the masses to a chiral breaking scale $\Lambda_\chi = 4\pi F_\pi/\sqrt{N_f}$. The first number ($s = 0.2$) corresponds to a phenomenologically favorable value [3, 4], $F_\phi \simeq \sqrt{2N_f} F_\pi/0.44 \simeq 1.1$ TeV, consistent with the current Higgs boson data at the LHC. The third one ($s = 1.0$) is the holographic estimate in the large N_c limit [4]. The second value ($s = 0.5$) is just a sample number in between. The close-up

We have that:

s ≈ r = (2*8*123^2) / ((sqrt(2*8)*123*1/0.44))

Input:

$$\frac{2\times 8\times 123^2}{\left(\sqrt{2\times 8}\times 123\times \frac{1}{0.44}\right)^2}$$

Result:

0.1936

0.1936 ≈ 0.2

And:

((((2*8*123^2) / ((sqrt(2*8)*123*1/0.44))^2)))^1/64

Input:

$$\sqrt[64]{\frac{2\times 8\times 123^2}{\left(\sqrt{2\times 8}\times 123\times \frac{1}{0.44}\right)^2}}$$

Result:

0.97467067...

0.97467067... result very near to the spectral index n_s , to the mesonic Regge slope (see Appendix), to the inflaton value at the end of the inflation 0.9402 and to the value of the following Rogers-Ramanujan continued fraction:

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

((1/ ((((2*8*123^2) / ((sqrt(2*8)*123*1/0.44))^2)))))^3

Input:

$$\left(\frac{1}{\frac{2\times8\times123^2}{\left(\sqrt{2\times8}\times123\times\frac{1}{0.44}\right)^2}}\right)^3$$

Result:

137.8110180795355056924373476273185061084546340769524729885...

137.811018... result very near to the rest mass of Pion meson 139.57

((1/ ((((2*8*123^2) / ((sqrt(2*8)*123*1/0.44))^2)))))^3 – 13

Input:

$$\left(\frac{1}{\frac{2\times8\times123^2}{\left(\sqrt{2\times8}\times123\times\frac{1}{0.44}\right)^2}}\right)^3-13$$

Result:

124.81101807953550569243734762731850610845463407695247298 85...

124.811018.... result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

From:

On a Polya functional for rhombi, isosceles triangles, and thinning convex sets.
M. van den Berg** , V. Ferone*, C. Nitsch*, C. Trombetti* -
https://arxiv.org/abs/1811.04503

We have that:

Let $\triangle_\beta$ be an isosceles triangle with angles $\beta, \beta, \alpha = \pi - 2\beta$. We first consider the case $\frac{\pi}{3} \leq \alpha < \pi$. We denote the height by d, and we fix the length of the basis equal to 2. See Figure 3.

We use the function

$$u(x,y) = \begin{cases} \dfrac{d^2x^2}{4} - \left(y - \dfrac{dx}{2}\right)^2, & 0 \leq x \leq 1, \\ \dfrac{d^2(2-x)^2}{4} - \left(y - \dfrac{d(2-x)}{2}\right)^2, & 1 \leq x \leq 2, \end{cases}$$

as a test function for the torsion of $\triangle_\beta$. We find that

$$\frac{2}{T(\triangle_\beta)} \leq \frac{48(1+d^2)}{d^3}. \tag{5.1}$$

Hence

$$\frac{T(\triangle_\beta)}{|\triangle_\beta|} \geq \frac{1}{24}\left(1 + \frac{1}{d^2}\right)^{-1}. \tag{5.2}$$

We wish to estimate $\lambda(\triangle_\beta)$ from below. To this aim we consider the first Dirichlet eigenfunction of $\triangle_\beta$ restricted to $x \in [0,1]$ and we reflect it, anti-symmetrically, with respect to the line $y = dx$ (see Figure 4). This new function is a test function defined on the rectangle of sides $1, d$ (shaded in grey in Figure 4) orthogonal to the first eigenfunction of the Laplacian with the mixed boundary conditions described in Figure 4.

For $\frac{\pi}{3} \leq \alpha \leq \pi$ we find that

$$\lambda(\triangle_\beta) \geq \min\left\{\pi^2\left(1 + \frac{1}{d^2}\right), \frac{4\pi^2}{d^2}\right\} = \pi^2\left(1 + \frac{1}{d^2}\right). \tag{5.3}$$

Combining (5.2) and (5.3) we obtain

$$\frac{T(\triangle_\beta)\lambda(\triangle_\beta))}{|\triangle_\beta|} \geq \frac{\pi^2}{24}, \; 0 < \beta \leq \frac{\pi}{3}.$$

Next we consider the case $0 < \alpha \leq \frac{\pi}{3}$ or $\pi/3 \leq \beta < \pi/2$. We have

$$|\triangle_\beta| = 1/\tan(\alpha/2). \tag{5.4}$$

Let

$$S(\rho, \alpha) = \{(r, \phi) : 0 < r < \rho, \; -\alpha/2 < \phi < \alpha/2\}$$

be the circular sector with radius ρ and opening angle α. Siudeja's Theorem 1.3 in [9] asserts that for $0<\beta\le\pi/3$, $\lambda(\triangle_{\pi/2-\alpha/2})\ge\lambda(S(\rho,\alpha))$, where d is such that $|\triangle_\beta|=|S(\rho,\alpha)|$. It follows that

$$\rho^2=2/(\alpha\tan(\alpha/2)). \tag{5.5}$$

Hence

$$\lambda(\triangle_\beta)\ge 2^{-1}\alpha\tan(\alpha/2)j_{\pi/\alpha}^2.$$

where we have used that the first Dirichlet eigenvalue of a circular sector of opening angle β and radius ρ equals $j_{\pi/\beta}^2\rho^{-2}$. See [8]. Moreover by (1.2) and (4.3) for $k=1$ and $\nu=\pi/\alpha$ in [11] we have

$$j_{\pi/\alpha}^2>\left(\frac{\pi}{\alpha}-\frac{a_1}{2^{1/3}}\left(\frac{\pi}{\alpha}\right)^{1/3}\right)^2,\quad -a_1\ge\left(\frac{9\pi}{8}\right)^{2/3},$$

where a_1 is the first negative zero of the Airy function. It follows that

$$j_{\pi/\alpha}^2\ge\frac{\pi^2}{\alpha^2}\left(1+C\left(\frac{\alpha}{\pi}\right)^{2/3}\right)^2\ge\frac{\pi^2}{\alpha^2}(1+C_1\alpha^{2/3}), \tag{5.6}$$

where

$$C=(9\pi/8)^{2/3}2^{-1/3},\ C_1=(9/4)^{2/3}. \tag{5.7}$$

The torsion function for $S(\rho,\alpha)$, $\alpha<\pi/2$, is given by (p.279 in [13]),

$$\begin{aligned}v_{S(\rho,\alpha)}(r,\phi)=&\frac{r^2}{4}\left(\frac{\cos(2\phi)}{\cos\alpha}-1\right)\\&+\frac{4\rho^2\alpha^2}{\pi^3}\sum_{n=1,3,5,\dots}(-1)^{(n+1)/2}\left(\frac{r}{\rho}\right)^{n\pi/\alpha}\cos\left(\frac{n\pi\phi}{\alpha}\right)n^{-1}\left(n+\frac{2\alpha}{\pi}\right)^{-1}\left(n-\frac{2\alpha}{\pi}\right)^{-1}.\end{aligned}$$

By monotonicity of the torsion we obtain

$$\begin{aligned}T(\triangle_\beta)&\ge T(S(\rho,\alpha))\\&=\int_{(0,d)}r\,dr\int_{(-\alpha/2,\alpha/2)}d\phi v_{S(d,\alpha)}(r,\phi)\\&=\frac{d^4}{16}\left(\tan\alpha-\alpha-\frac{128\alpha^4}{\pi^5}\sum_{n=1,3,..}n^{-2}\left(n+\frac{2\alpha}{\pi}\right)^{-2}\left(n-\frac{2\alpha}{\pi}\right)^{-1}\right),\end{aligned}\tag{5.8}$$

We have that for $0<\alpha\le\pi/3$, $(n+2\alpha/\pi)^2(n-2\alpha/\pi)\ge\frac{25}{27}n^3$, $n\in\mathbb{N}$. This gives that

$$\begin{aligned}T(\triangle_\beta)&\ge\frac{\rho^4}{16}\left(\tan\alpha-\alpha-\frac{2^23^331\zeta(5)\alpha^4d^4}{25\pi^5}\right)\\&\ge\frac{\alpha^3\rho^4}{48}(1-C_2\alpha),\end{aligned}\tag{5.9}$$

where

$$C_2=\frac{2^23^431\zeta(5)}{5^2\pi^5}.$$

By (5.6), (5.8), (5.9), and (5.4) we obtain

$$\frac{T(\triangle_\beta)\lambda(\triangle_\beta)}{|\triangle_\beta|}\ge\frac{\pi^2}{24}(1-C_2\alpha)(1+C_1\alpha^{2/3}). \tag{5.10}$$

The right-hand side of (5.10) is greater or equal than $\frac{\pi^2}{24}$ for

$$C_1\ge C_1C_2\alpha+C_2\alpha^{1/3}. \tag{5.11}$$

Inequality (5.11) holds for all $\alpha\le 33/100$.

We have, from (5.10):

(Pi^2)/24(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3)))

Input:

$$\frac{\pi^2}{24}\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)$$

$\zeta(s)$ is the Riemann zeta function

Result:

0.0750067...

0.0750067…

Alternative representations:

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = \frac{1}{24}\,\pi^2\left(1-\frac{40.92\times 3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)\zeta(5,\,1)}{25\,\pi^5}\right)$$

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = \frac{1}{24}\,\pi^2\left(1-\frac{40.92\,S_{4,1}(1)\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{25\,\pi^5}\right)$$

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = \frac{1}{24}\,\pi^2\left(1+\frac{40.92\,\mathrm{Li}_5(-1)\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{\left(1-\frac{1}{2^4}\right)\left(25\,\pi^5\right)}\right)$$

Series representations:

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = 0.0416667\,\pi^2-\frac{10.0539\sum_{k=1}^{\infty}\frac{1}{k^5}}{\pi^3}$$

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = 0.0416667\,\pi^2+\frac{10.7241\sum_{k=1}^{\infty}\frac{(-1)^k}{k^5}}{\pi^3}$$

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = 0.0416667\,\pi^2-\frac{10.3782\sum_{k=0}^{\infty}\frac{1}{(1+2k)^5}}{\pi^3}$$

Integral representations:

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = 0.0416667\,\pi^2-\frac{10.0539}{\pi^3\,\Gamma(5)}\int_0^{\infty}\frac{t^4}{-1+e^t}\,dt$$

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = \frac{\pi^2}{24}-\frac{10.0539}{\pi^3\,\Gamma(5)}\int_0^{\infty}\frac{t^4}{-1+e^t}\,dt$$

$$\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2 = \frac{\pi^2}{24}-\frac{5.1891}{\pi^3\,\Gamma(5)}\int_0^{\infty}t^4\,\mathrm{csch}(t)\,dt$$

We note that:

6((((((Pi^2)/24(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3)))))))))^1/2

Input:

$$6\sqrt{\frac{\pi^2}{24}\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)}$$

$\zeta(s)$ is the Riemann zeta function

Result:

1.6432409907590804971911054275288798346493396405827370264 28...

1.64324099075…. ≈ ζ(2) = $\frac{\pi^2}{6} = 1.644934$ ...

Alternative representations:

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$6\sqrt{\frac{1}{24}\pi^2\left(1-\frac{40.92\times 3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)\zeta(5,1)}{25\,\pi^5}\right)}$$

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$6\sqrt{\frac{1}{24}\pi^2\left(1-\frac{40.92\,S_{4,1}(1)\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{25\,\pi^5}\right)}$$

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$6\sqrt{\frac{1}{24}\pi^2\left(1-\frac{40.92\,\psi^{(4)}(1)\,(-1)^5\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{4!\,(25\,\pi^5)}\right)}$$

Series representations:

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2} = 1.22474\sqrt{\pi^2-\frac{241.293\sum_{k=1}^{\infty}\frac{1}{k^5}}{\pi^3}}$$

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2} = 1.22474\sqrt{\pi^2+\frac{257.379\sum_{k=1}^{\infty}\frac{(-1)^k}{k^5}}{\pi^3}}$$

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2} = 1.22474\sqrt{\pi^2-\frac{249.077\sum_{k=0}^{\infty}\frac{1}{(1+2k)^5}}{\pi^3}}$$

Integral representations:

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2} = \sqrt{1.5\,\pi^2-\frac{361.939}{\pi^3\,\Gamma(5)}\int_0^{\infty}\frac{t^4}{-1+e^t}\,dt}$$

$$6\sqrt{\frac{1}{24}\left(1-\frac{((2^2\times 3^4\times 31\,\zeta(5))\,0.33)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2} = \sqrt{\frac{3}{2}}\sqrt{\pi^2-\frac{124.538}{\pi^3\,\Gamma(5)}\int_0^{\infty}t^4\,\mathrm{csch}(t)\,dt}$$

$$6\sqrt{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2} = \sqrt{\frac{3}{2}}\sqrt{\pi^2-\frac{241.293}{\pi^3\,\Gamma(5)}\int_0^\infty \frac{t^4}{-1+e^t}\,dt}$$

We have also:

64-Pi+125.18/(((((Pi^2)/24(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3)))))))

Where 125.18 is the Higgs boson mass

Input interpretation:

$$64-\pi+\frac{125.18}{\frac{\pi^2}{24}\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)}$$

$\zeta(s)$ is the Riemann zeta function

Result:

1729.78…

1729.78…

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

Alternative representations:

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$64-\pi+\frac{125.18}{\frac{1}{24}\,\pi^2\left(1-\frac{40.92\times 3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)\zeta(5,1)}{25\,\pi^5}\right)}$$

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$64-\pi+\frac{125.18}{\frac{1}{24}\,\pi^2\left(1-\frac{40.92\,S_{4,1}(1)\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{25\,\pi^5}\right)}$$

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$64-\pi+\frac{125.18}{\frac{1}{24}\,\pi^2\left(1-\frac{40.92\,\psi^{(4)}(1)(-1)^5\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{4!\left(25\,\pi^5\right)}\right)}$$

Series representations:

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$64-\pi+\frac{3004.32\,\pi^3}{\pi^5-241.293\sum_{k=1}^{\infty}\frac{1}{k^5}}$$

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$64-\pi+\frac{3004.32\,\pi^3}{\pi^5+257.379\sum_{k=1}^{\infty}\frac{(-1)^k}{k^5}}$$

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$64-\pi+\frac{3004.32\,\pi^3}{\pi^5-249.077\sum_{k=0}^{\infty}\frac{1}{(1+2k)^5}}$$

Integral representations:

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$64-\pi+\frac{3004.32\,\pi^3\,\Gamma(5)}{\pi^5\,\Gamma(5)-124.538\int_0^{\infty}t^4\operatorname{csch}(t)\,dt}$$

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$64-\pi+\frac{3004.32\,\pi^3\,\Gamma(5)}{\pi^5\,\Gamma(5)-241.293\int_0^{\infty}\frac{t^4}{-1+e^t}\,dt}$$

$$64-\pi+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$64-\pi+\frac{3004.32\,\pi^3\,\Gamma(5)}{\pi^5\,\Gamma(5)-257.379\int_0^{\infty}\frac{t^4}{1+e^t}\,dt}$$

(76+29+11)+125.18/(((((Pi^2)/24(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3))))))))

Input interpretation:

$$(76+29+11)+\frac{125.18}{\frac{\pi^2}{24}\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)}$$

$\zeta(s)$ is the Riemann zeta function

Result:

1784.92...

1784.92…. result in the range of the hypothetical mass of Gluino (gluino = 1785.16 GeV).

Alternative representations:

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$116+\frac{125.18}{\frac{1}{24}\,\pi^2\left(1-\frac{40.92\times 3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)\zeta(5,1)}{25\,\pi^5}\right)}$$

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$116+\frac{125.18}{\frac{1}{24}\,\pi^2\left(1-\frac{40.92\,S_{4,1}(1)\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{25\,\pi^5}\right)}$$

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$116+\frac{125.18}{\frac{1}{24}\,\pi^2\left(1-\frac{40.92\,\psi^{(4)}(1)(-1)^5\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{4!\left(25\,\pi^5\right)}\right)}$$

Series representations:

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$
$$116+\frac{3004.32\,\pi^3}{\pi^5-241.293\sum_{k=1}^{\infty}\frac{1}{k^5}}$$

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$116+\frac{3004.32\,\pi^3}{\pi^5+257.379\sum_{k=1}^{\infty}\frac{(-1)^k}{k^5}}$$

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$116+\frac{3004.32\,\pi^3}{\pi^5-249.077\sum_{k=0}^{\infty}\frac{1}{(1+2\,k)^5}}$$

Integral representations:

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$116+\frac{3004.32\,\pi^3\,\Gamma(5)}{\pi^5\,\Gamma(5)-124.538\int_0^{\infty}t^4\,\operatorname{csch}(t)\,dt}$$

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$116+\frac{3004.32\,\pi^3\,\Gamma(5)}{\pi^5\,\Gamma(5)-241.293\int_0^{\infty}\frac{t^4}{-1+e^t}\,dt}$$

$$(76+29+11)+\frac{125.18}{\frac{1}{24}\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)\pi^2}=$$

$$116+\frac{3004.32\,\pi^3\,\Gamma(5)}{\pi^5\,\Gamma(5)-257.379\int_0^{\infty}\frac{t^4}{1+e^t}\,dt}$$

And:

((((((Pi^2)/24(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3)))))))))^1/256

Input:

$$\sqrt[256]{\frac{\pi^2}{24}\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)}$$

$\zeta(s)$ is the Riemann zeta function

Result:

0.98993313...

0.98993313... 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 practically equal to the dilaton value $\mathbf{0.989117352243 = \phi}$

We note that:

(((((x(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3))))))))) = 0.0750067

Input interpretation:

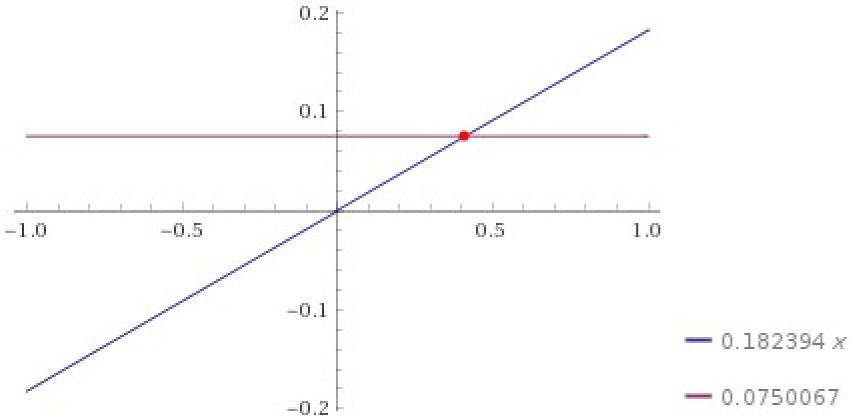
$$x\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)=0.0750067$$

$\zeta(s)$ is the Riemann zeta function

Result:

$0.182394\,x = 0.0750067$

Plot:



Alternate form:

$0.182394\,x - 0.0750067 = 0$

Alternate form assuming x is real:

$0.182394\,x + 0 = 0.0750067$

Solution:

$x \approx 0.411234$

0.411234

Possible closed forms:

$\frac{\pi^2}{24} \approx 0.4112335167$

$\frac{\zeta(2)}{4} \approx 0.4112335167$

$\frac{69}{17\pi^2} \approx 0.4112444804$

-((((sqrt(5)-1))/2))+[1/(((((Pi^2/24(1-((2^2*3^4*31*zeta(5))/((25Pi^5))*0.33)(1+((9/4)^(2/3)*0.33^(2/3)))))))))] * 1/(3Pi)

Input:

$$-\left(\frac{1}{2}\left(\sqrt{5}-1\right)\right)+\frac{1}{\left(\frac{\pi^2}{24}\left(1-\left(\frac{2^2\times 3^4\times 31\,\zeta(5)}{25\,\pi^5}\times 0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}\times 0.33^{2/3}\right)\right)\right)\times\frac{1}{3\pi}}$$

$\zeta(s)$ is the Riemann zeta function

Result:

125.034...

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

Alternative representations:

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$\frac{1}{\frac{\pi^2\left(1-\frac{40.92\times 3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)\zeta(5,1)}{25\,\pi^5}\right)}{24\,(3\,\pi)}}+\frac{1}{2}\left(1-\sqrt{5}\right)$$

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$\frac{1}{\frac{\pi^2\left(1-\frac{40.92\,S_{4,1}(1)\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{25\,\pi^5}\right)}{24\,(3\,\pi)}}+\frac{1}{2}\left(1-\sqrt{5}\right)$$

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$\frac{1}{\frac{\pi^2\left(1-\frac{40.92\,\psi^{(4)}(1)(-1)^5\,3^4\left(1+0.33^{2/3}\left(\frac{9}{4}\right)^{2/3}\right)}{4!\,(25\,\pi^5)}\right)}{24\,(3\,\pi)}}+\frac{1}{2}\left(1-\sqrt{5}\right)$$

Series representations:

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$-\left(\left(0.5\left(-144\,\pi^4-\pi^5+241.293\sum_{k=1}^{\infty}\frac{1}{k^5}+\pi^5\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}-241.293\sqrt{4}\sum_{k_1=1}^{\infty}\sum_{k_2=0}^{\infty}\frac{4^{-k_2}\binom{\frac{1}{2}}{k_2}}{k_1^5}\right)\right)\Big/\left(\pi^5-241.293\sum_{k=1}^{\infty}\frac{1}{k^5}\right)\right)$$

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$-\left(\left(0.5\left(-144\,\pi^4-\pi^5+241.293\exp\left(-\sum_{k=1}^{\infty}\log\left(1-\frac{1}{(p_k)^5}\right)\right)+\pi^5\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}-241.293\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\exp\left(-\sum_{k=1}^{\infty}\log\left(1-\frac{1}{(p_k)^5}\right)\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Big/\left(\pi^5-241.293\exp\left(-\sum_{k=1}^{\infty}\log\left(1-\frac{1}{(p_k)^5}\right)\right)\right)\right)\quad\text{for } (x\in\mathbb{R}\text{ and } x<0)$$

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$-\left(\left(0.5\left(-144\,\pi^4-\pi^5+241.293\exp\left(\sum_{k=1}^{\infty}\sum_{j=1}^{\infty}\frac{(p_k)^{-5\,j}}{j}\right)+\pi^5\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}-241.293\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\exp\left(\sum_{k=1}^{\infty}\sum_{j=1}^{\infty}\frac{(p_k)^{-5\,j}}{j}\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Big/\left(\pi^5-241.293\exp\left(\sum_{k=1}^{\infty}\sum_{j=1}^{\infty}\frac{(p_k)^{-5\,j}}{j}\right)\right)\right) \text{ for } (x\in\mathbb{R} \text{ and } x<0)$$

Integral representations:

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$\frac{1}{2}+\frac{72\,\pi^4\,\Gamma(5)}{\pi^5\,\Gamma(5)-124.538\int_0^{\infty}t^4\,\operatorname{csch}(t)\,dt}-\frac{\sqrt{5}}{2}$$

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$\frac{1}{2}+\frac{72\,\pi^4\,\Gamma(5)}{\pi^5\,\Gamma(5)-241.293\int_0^{\infty}\frac{t^4}{-1+e^t}\,dt}-\frac{\sqrt{5}}{2}$$

$$-\frac{1}{2}\left(\sqrt{5}-1\right)+\frac{1}{\frac{\pi^2\left(1-\frac{\left(\left(2^2\times 3^4\times 31\,\zeta(5)\right)0.33\right)\left(1+\left(\frac{9}{4}\right)^{2/3}0.33^{2/3}\right)}{25\,\pi^5}\right)}{(3\,\pi)\,24}}=$$

$$\frac{1}{2}+\frac{72\,\pi^4\,\Gamma(5)}{\pi^5\,\Gamma(5)-257.379\int_0^{\infty}\frac{t^4}{1+e^t}\,dt}-\frac{\sqrt{5}}{2}$$

From (5.11), we have:

(9/4)^(2/3)(((((2^2*3^4*31*zeta(5)))/((25Pi^5)))))0.33+
(((((2^2*3^4*31*zeta(5)))/((25Pi^5))))) (9/4)^1/3

Input:

$$\left(\frac{9}{4}\right)^{2/3} \times \frac{2^2 \times 3^4 \times 31\, \zeta(5)}{25\, \pi^5} \times 0.33 + \frac{2^2 \times 3^4 \times 31\, \zeta(5)}{25\, \pi^5} \sqrt[3]{\frac{9}{4}}$$

$\zeta(s)$ is the Riemann zeta function

Result:

2.555236...

2.555236…

Alternative representations:

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\, \zeta(5)\right)}{25\, \pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\, \left(2^2 \times 3^4 \times 31\, \zeta(5)\right)}{25\, \pi^5} = \frac{124 \times 3^4 \sqrt[3]{\frac{9}{4}}\, \zeta(5, 1)}{25\, \pi^5} + \frac{40.92 \times 3^4 \left(\frac{9}{4}\right)^{2/3} \zeta(5, 1)}{25\, \pi^5}$$

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\, \zeta(5)\right)}{25\, \pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\, \left(2^2 \times 3^4 \times 31\, \zeta(5)\right)}{25\, \pi^5} = \frac{124\, S_{4,1}(1)\, 3^4 \sqrt[3]{\frac{9}{4}}}{25\, \pi^5} + \frac{40.92\, S_{4,1}(1)\, 3^4 \left(\frac{9}{4}\right)^{2/3}}{25\, \pi^5}$$

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\, \zeta(5)\right)}{25\, \pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\, \left(2^2 \times 3^4 \times 31\, \zeta(5)\right)}{25\, \pi^5} = -\frac{124\, \mathrm{Li}_5(-1)\, 3^4 \sqrt[3]{\frac{9}{4}}}{\left(1 - \frac{1}{2^4}\right)\left(25\, \pi^5\right)} - \frac{40.92\, \mathrm{Li}_5(-1)\, 3^4 \left(\frac{9}{4}\right)^{2/3}}{\left(1 - \frac{1}{2^4}\right)\left(25\, \pi^5\right)}$$

Series representations:

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\,\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} = \frac{754.105 \sum_{k=1}^{\infty} \frac{1}{k^5}}{\pi^5}$$

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\,\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} = -\frac{804.379 \sum_{k=1}^{\infty} \frac{(-1)^k}{k^5}}{\pi^5}$$

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\,\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} = \frac{778.431 \sum_{k=0}^{\infty} \frac{1}{(1+2\,k)^5}}{\pi^5}$$

Integral representations:

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\,\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} = \frac{754.105}{\pi^5\,\Gamma(5)} \int_0^{\infty} \frac{t^4}{-1+e^t}\,dt$$

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\,\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} = \frac{804.379}{\pi^5\,\Gamma(5)} \int_0^{\infty} \frac{t^4}{1+e^t}\,dt$$

$$\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\,\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} = \frac{389.216}{\pi^5\,\Gamma(5)} \int_0^{\infty} t^4 \operatorname{csch}(t)\,dt$$

1/((((9/4)^(2/3)(((((2^2*3^4*31*zeta(5)))/((25Pi^5)))))0.33+(((((2^2*3^4*31*zeta(5)))/((25Pi^5))))) (9/4)^1/3)))^1/64

Input:

$$\frac{1}{\sqrt[64]{\left(\frac{9}{4}\right)^{2/3} \times \frac{2^2 \times 3^4 \times 31\,\zeta(5)}{25\,\pi^5} \times 0.33 + \frac{2^2 \times 3^4 \times 31\,\zeta(5)}{25\,\pi^5}\,\sqrt[3]{\frac{9}{4}}}}$$

$\zeta(s)$ is the Riemann zeta function

Result:

0.98544840…

0.98544840… 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 $\mathbf{0.989117352243}=\boldsymbol{\phi}$

Alternative representations:

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3}0.33\right)\left(2^2\times 3^4\times 31\,\zeta(5)\right)}{25\,\pi^5}+\frac{\sqrt[3]{\frac{9}{4}}\left(2^2\times 3^4\times 31\,\zeta(5)\right)}{25\,\pi^5}}}=\frac{1}{\sqrt[64]{\frac{124\times 3^4\sqrt[3]{\frac{9}{4}}\,\zeta(5,1)}{25\,\pi^5}+\frac{40.92\times 3^4\left(\frac{9}{4}\right)^{2/3}\zeta(5,1)}{25\,\pi^5}}}$$

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3}0.33\right)\left(2^2\times 3^4\times 31\,\zeta(5)\right)}{25\,\pi^5}+\frac{\sqrt[3]{\frac{9}{4}}\left(2^2\times 3^4\times 31\,\zeta(5)\right)}{25\,\pi^5}}}=\frac{1}{\sqrt[64]{\frac{124\,S_{4,1}(1)\,3^4\sqrt[3]{\frac{9}{4}}}{25\,\pi^5}+\frac{40.92\,S_{4,1}(1)\,3^4\left(\frac{9}{4}\right)^{2/3}}{25\,\pi^5}}}$$

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{1}{\sqrt[64]{\frac{124\,\psi^{(4)}(1)(-1)^5\, 3^4\, \sqrt[3]{\frac{9}{4}}}{4!\left(25\,\pi^5\right)} + \frac{40.92\,\psi^{(4)}(1)(-1)^5\, 3^4 \left(\frac{9}{4}\right)^{2/3}}{4!\left(25\,\pi^5\right)}}}$$

Series representations:

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{0.901654}{\sqrt[64]{\frac{\sum_{k=1}^{\infty} \frac{1}{k^5}}{\pi^5}}}$$

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{0.900746}{\sqrt[64]{-\frac{\sum_{k=1}^{\infty} \frac{(-1)^k}{k^5}}{\pi^5}}}$$

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{0.901207}{\sqrt[64]{\frac{\sum_{k=0}^{\infty} \frac{1}{(1+2k)^5}}{\pi^5}}}$$

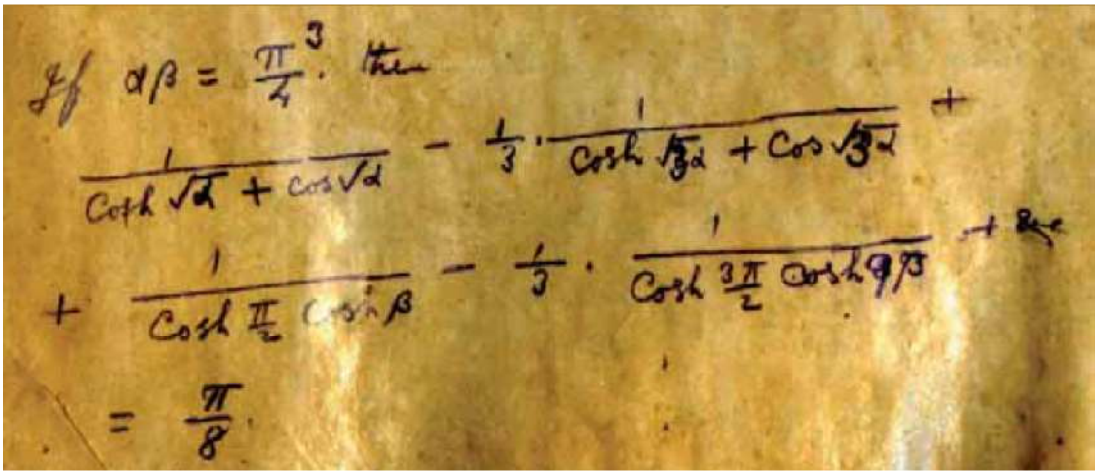
Integral representations:

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{0.911021}{\sqrt[64]{\frac{1}{\pi^5\,\Gamma(5)} \int_0^\infty t^4 \operatorname{csch}(t)\,dt}}$$

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{0.901654}{\sqrt[64]{\frac{1}{\pi^5\,\Gamma(5)} \int_0^\infty \frac{t^4}{-1+e^t}\,dt}}$$

$$\frac{1}{\sqrt[64]{\frac{\left(\left(\frac{9}{4}\right)^{2/3} 0.33\right)\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5} + \frac{\sqrt[3]{\frac{9}{4}}\left(2^2 \times 3^4 \times 31\,\zeta(5)\right)}{25\,\pi^5}}} = \frac{0.900746}{\sqrt[64]{\frac{1}{\pi^5\,\Gamma(5)} \int_0^\infty \frac{t^4}{1+e^t}\,dt}}$$

From the Ramanujan expression, previously analyzed,


If $\alpha\beta = \frac{\pi^3}{4}$, then

$$\frac{1}{\cosh\sqrt{\alpha} + \cos\sqrt{\alpha}} - \frac{1}{3}\cdot\frac{1}{\cosh\sqrt{3\alpha} + \cos\sqrt{3\alpha}} + \ldots$$

$$+ \frac{1}{\cosh\frac{\pi}{2}\cosh\beta} - \frac{1}{3}\cdot\frac{1}{\cosh\frac{3\pi}{2}\cosh 9\beta} + \&c$$

$$= \frac{\pi}{8}.$$

We obtain, multiplying by $\pi/3$:

Pi/3*[1/(cosh(sqrt(Pi))+cos(sqrt(Pi)))-
1/3*1/((((cosh(sqrt(3Pi)))+(cos(sqrt(3Pi))))))+1/(cosh(Pi/2)*cosh(Pi^2/4))-
1/3*1/((((cosh((3Pi/2))(cosh(9Pi^2/4))))))]

Input:

$$\frac{\pi}{3}\left(\frac{1}{\cosh(\sqrt{\pi}) + \cos(\sqrt{\pi})} - \frac{1}{3}\times\frac{1}{\cosh(\sqrt{3\,\pi}) + \cos(\sqrt{3\,\pi})} + \frac{1}{\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)} - \frac{1}{3}\times\frac{1}{\cosh\left(3\times\frac{\pi}{2}\right)\cosh\left(9\times\frac{\pi^2}{4}\right)}\right)$$

$\cosh(x)$ is the hyperbolic cosine function

Exact result:

$$\frac{1}{3}\,\pi\left(\operatorname{sech}\left(\frac{\pi}{2}\right)\operatorname{sech}\left(\frac{\pi^2}{4}\right) - \frac{1}{3}\operatorname{sech}\left(\frac{3\,\pi}{2}\right)\operatorname{sech}\left(\frac{9\,\pi^2}{4}\right) + \frac{1}{\cos(\sqrt{\pi}) + \cosh(\sqrt{\pi})} - \frac{1}{3\,(\cos(\sqrt{3\,\pi}) + \cosh(\sqrt{3\,\pi}))}\right)$$

$\operatorname{sech}(x)$ is the hyperbolic secant function

Decimal approximation:

0.405036535399478329315852355006201558821470109131598612354...

0.405036535399…

Alternate forms:

$$\frac{2e^{\pi/2}\pi\operatorname{sech}\left(\frac{\pi^2}{4}\right)}{3(1+e^{\pi})}-\frac{1}{9}\pi\operatorname{sech}\left(\frac{3\pi}{2}\right)\operatorname{sech}\left(\frac{9\pi^2}{4}\right)+\frac{2\pi}{3(2\cos(\sqrt{\pi})+2\cosh(\sqrt{\pi}))}-\frac{2\pi}{9(2\cos(\sqrt{3\pi})+2\cosh(\sqrt{3\pi}))}$$

$$\frac{4\pi\cosh\left(\frac{\pi}{2}\right)\cosh\left(\frac{\pi^2}{4}\right)}{3(1+\cosh(\pi))\left(1+\cosh\left(\frac{\pi^2}{2}\right)\right)}-\frac{4\pi\cosh\left(\frac{3\pi}{2}\right)\cosh\left(\frac{9\pi^2}{4}\right)}{9(1+\cosh(3\pi))\left(1+\cosh\left(\frac{9\pi^2}{2}\right)\right)}+\frac{\pi}{3(\cos(\sqrt{\pi})+\cosh(\sqrt{\pi}))}-\frac{\pi}{9(\cos(\sqrt{3\pi})+\cosh(\sqrt{3\pi}))}$$

$$\frac{4\pi}{3\left(e^{-\pi/2}+e^{\pi/2}\right)\left(e^{-\pi^2/4}+e^{\pi^2/4}\right)}-\frac{4\pi}{9\left(e^{-(3\pi)/2}+e^{(3\pi)/2}\right)\left(e^{-(9\pi^2)/4}+e^{(9\pi^2)/4}\right)}+\frac{\pi}{3\left(\frac{1}{2}\left(e^{-\sqrt{\pi}}+e^{\sqrt{\pi}}\right)+\frac{1}{2}\left(e^{-i\sqrt{\pi}}+e^{i\sqrt{\pi}}\right)\right)}-\frac{\pi}{9\left(\frac{1}{2}\left(e^{-\sqrt{3\pi}}+e^{\sqrt{3\pi}}\right)+\frac{1}{2}\left(e^{-i\sqrt{3\pi}}+e^{i\sqrt{3\pi}}\right)\right)}$$

Where the result 0.4050365353994.... is very near to

Input:

$$\frac{\pi^2}{24}$$

Decimal approximation:

0.411233516712056609118103791661506297304737475301699609433...

0.411233516712056609….

Property:

$\frac{\pi^2}{24}$ is a transcendental number

From:

MODULAR EQUATIONS IN THE SPIRIT OF RAMANUJAN

M. S. Mahadeva Naika
Department of Mathematics, Central College Campus, Bangalore University, Bengaluru-560 001, INDIA - “IIIT - BANGALORE” - June 25, 2012

We have that:

THEOREM

If $P := \dfrac{\varphi(q)}{\varphi(q^5)}$ *and* $Q := \dfrac{\varphi(-q^4)}{\varphi(-q^{20})}$, *then*

$$\frac{P^4}{Q^4} + \frac{Q^4}{P^4} + 24\left(\frac{P^2}{Q^2} + \frac{Q^2}{P^2}\right) + 8\left(P^2Q^2 + \frac{5^2}{P^2Q^2}\right) + 3\left(Q^4 + \frac{5^2}{Q^4}\right) + 120$$
$$= 20\left(P^2 + \frac{5}{P^2}\right) + 32\left(Q^2 + \frac{5}{Q^2}\right) + \left(P^2Q^4 + \frac{125}{P^2Q^4}\right) + 3\left(\frac{5P^2}{Q^4} + \frac{Q^4}{P^2}\right). \quad (72)$$

For P = Q = 1, we obtain:

1+1+24(1+1)+8(1+5^2)+3(1+5^2)+120 = 20(1+5)+32(1+5)+(1+125)+3(5+1)

Input:

$1 + 1 + 24(1+1) + 8(1+5^2) + 3(1+5^2) + 120 =$
$20(1+5) + 32(1+5) + (1+125) + 3(5+1)$

Result:

True

Left hand side:

$1 + 1 + 24(1+1) + 8(1+5^2) + 3(1+5^2) + 120 = 456$

Right hand side:

$20(1+5) + 32(1+5) + (1+125) + 3(5+1) = 456$

456

Now, we have that:

20(1+5)+32(1+5)+(1+x)+3(5+1) = 456

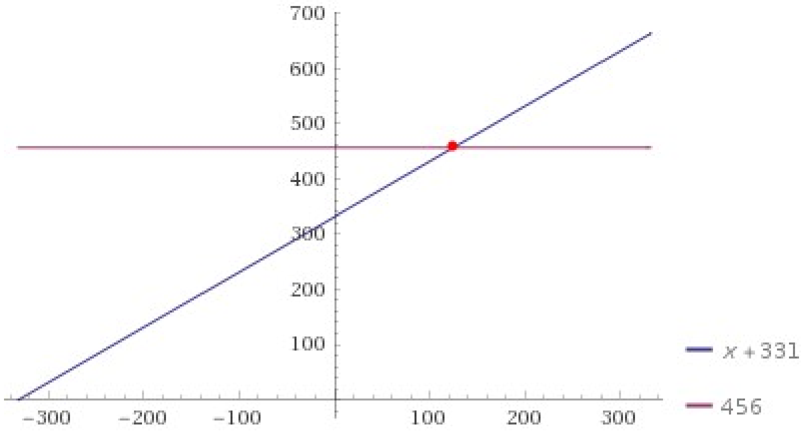
Input:

$20(1+5) + 32(1+5) + (1+x) + 3(5+1) = 456$

Result:

$x + 331 = 456$

Plot:



Alternate form:

$x - 125 = 0$

Solution:

$x = 125$

$$20\left(P^2 + \frac{5}{P^2}\right) + 32\left(Q^2 + \frac{5}{Q^2}\right) + \left(P^2Q^4 + \frac{125}{P^2Q^4}\right) + 3\left(\frac{5P^2}{Q^4} + \frac{Q^4}{P^2}\right) = 456$$

20(1+5)+32(1+5)+(1+x)+3(5+1) = 456

$x + 331 = 456$

$x = 125$

$x = 125$ result practically equal to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

(We note that 331 is a prime number)

Now, we have that:

THEOREM

If $X = \dfrac{\varphi(q)\varphi(q^9)}{\varphi(q^4)\varphi(q^{36})}$ *and* $Y = \dfrac{\varphi(q)\varphi(q^{36})}{\varphi(q^4)\varphi(q^9)}$, *then*

$$
\begin{aligned}
&Y^6 + \frac{1}{Y^6} - 908\left[Y^5 + \frac{1}{Y^5}\right] - 83582\left[Y^4 + \frac{1}{Y^4}\right] - 1369692\left[Y^3 + \frac{1}{Y^3}\right] \\
&-3\left[Y^2 + \frac{1}{Y^2}\right]\left\{2657883 + 96832\left[X^2 + \frac{16}{X^2}\right]\right\} - 24\left[Y + \frac{1}{Y}\right] \\
&\times\left\{892353 + 289628\left[X + \frac{4}{X}\right]\right\} + 17323008\left[\sqrt{Y} + \frac{1}{\sqrt{Y}}\right]\left[\sqrt{X} + \frac{2}{\sqrt{X}}\right] \\
&+1831776\left[\sqrt{Y^3} + \frac{1}{\sqrt{Y^3}}\right]\left[\sqrt{X^3} + \frac{8}{\sqrt{X^3}}\right] + 21504\left[\sqrt{Y^5} + \frac{1}{\sqrt{Y^5}}\right] \\
&\times\left[\sqrt{X^5} + \frac{32}{\sqrt{X^5}}\right] - 29469924 = 128\left\{2\left[X^4 + \frac{256}{X^4}\right]\right. \\
&\left.+420\left[X^3 + \frac{64}{X^3}\right] + 9987\left[X^2 + \frac{16}{X^2}\right] + 75426\left[X + \frac{4}{X}\right]\right\}.
\end{aligned}
\tag{63}
$$

From which:

For X = 1, we obtain:

128[(2(1+256)+420(1+64)+9987(1+16)+75426(1+4)]

Input:

128 (2 (1 + 256) + 420 (1 + 64) + 9987 (1 + 16) + 75 426 (1 + 4))

Result:

73564544

73564544

Scientific notation:

7.3564544×10^7

And:

[2(1+256)+420(1+64)+9987(1+16)+75426(1+4)]x =73564544

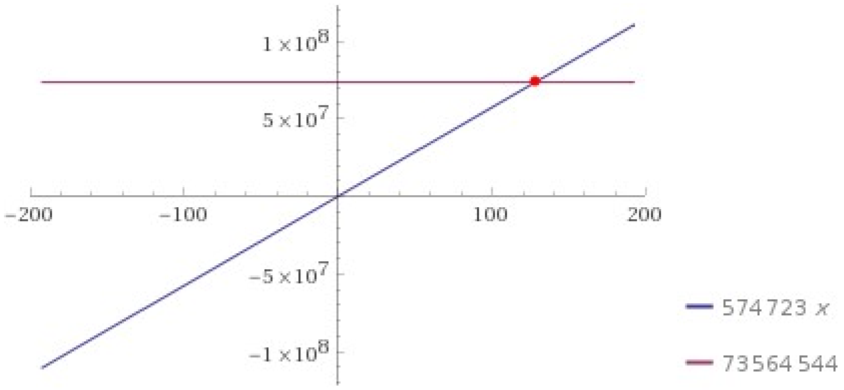
Input:

$(2(1+256)+420(1+64)+9987(1+16)+75426(1+4))x = 73564544$

Result:

$574723 x = 73564544$

Plot:



Alternate form:

$574723 x - 73564544 = 0$

Solution:

$x = 128$

$x = 128$

Note that:

(73564544/ 574723)-Pi

Input:

$$\frac{73564544}{574723} - \pi$$

Result:

$128 - \pi$

Decimal approximation:

124.8584073464102067615373566167204971158028306006248941790...

124.85840…. result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

Property:

$128 - \pi$ is a transcendental number

Alternative representations:

$$\frac{73564544}{574723} - \pi = -180° + \frac{73564544}{574723}$$

$$\frac{73564544}{574723} - \pi = i \log(-1) + \frac{73564544}{574723}$$

$$\frac{73564544}{574723} - \pi = -\cos^{-1}(-1) + \frac{73564544}{574723}$$

Series representations:

$$\frac{73564544}{574723} - \pi = 128 - 4 \sum_{k=0}^{\infty} \frac{(-1)^k}{1+2k}$$

$$\frac{73564544}{574723} - \pi = 128 + \sum_{k=0}^{\infty} \frac{4(-1)^k\, 1195^{-1-2k} \left(5^{1+2k} - 4 \times 239^{1+2k}\right)}{1+2k}$$

$$\frac{73564544}{574723} - \pi = 128 - \sum_{k=0}^{\infty} \left(-\frac{1}{4}\right)^k \left(\frac{1}{1+2k} + \frac{2}{1+4k} + \frac{1}{3+4k}\right)$$

Integral representations:

$$\frac{73564544}{574723} - \pi = 128 - 4 \int_0^1 \sqrt{1-t^2}\, dt$$

$$\frac{73564544}{574723} - \pi = 128 - 2 \int_0^1 \frac{1}{\sqrt{1-t^2}}\, dt$$

$$\frac{73564544}{574723} - \pi = 128 - 2 \int_0^{\infty} \frac{1}{1+t^2}\, dt$$

We observe that:

13/76 ((((128[2(1+256)+420(1+64)+9987(1+16)+75426(1+4)]))))^1/8

Input:

$$\frac{13}{76}\sqrt[8]{128\,(2\,(1+256)+420\,(1+64)+9987\,(1+16)+75\,426\,(1+4))}$$

Result:

$$\frac{13\sqrt[8]{\frac{574723}{2}}}{38}$$

Decimal approximation:

1.646126962493033032543860049384496560480210600584016181932...

$1.64612696.... \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934 ...$

Alternate form:

$$\frac{13}{76}\times 2^{7/8}\sqrt[8]{574\,723}$$

We have also:

THEOREM

If $P = \dfrac{\phi(q)\phi(q^{11})}{\phi(q^5)\phi(q^{55})}$ *and* $Q = \dfrac{\phi(q)\phi(q^{55})}{\phi(q^5)\phi(q^{11})}$, *then*

$$\begin{aligned}
&Q^6+\frac{1}{Q^6}+33\left(Q^5+\frac{1}{Q^5}\right)-99\left(Q^4+\frac{1}{Q^4}\right)+1529\left(Q^3+\frac{1}{Q^3}\right)\\
&-1683\left(Q^2+\frac{1}{Q^2}\right)+8800\left(Q+\frac{1}{Q}\right)=6534+\left(P^5+\frac{5^5}{P^5}\right)\\
&-11\left\{\left(P^4+\frac{5^4}{P^4}\right)\left(Q+\frac{1}{Q}\right)-\left(P^3+\frac{5^3}{P^3}\right)\left[11+4\left(Q^2+\frac{1}{Q^2}\right)\right]\right.\\
&-\left(P^2+\frac{5^2}{P^2}\right)\left[18-56\left(Q+\frac{1}{Q}\right)+3\left(Q^2+\frac{1}{Q^2}\right)-8\left(Q^3+\frac{1}{Q^3}\right)\right]\\
&-\left(P+\frac{5}{P}\right)\left[324-126\left(Q+\frac{1}{Q}\right)+160\left(Q^2+\frac{1}{Q^2}\right)-18\left(Q^3+\frac{1}{Q^3}\right)\right.\\
&\left.\left.+9\left(Q^4+\frac{1}{Q^4}\right)\right]-\left(P^3+\frac{5^3}{P^3}\right)\left[11+4\left(Q^2+\frac{1}{Q^2}\right)\right]\right\}.
\end{aligned}\tag{76}$$

For Q = 1, we obtain:

1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)

Input:

$$1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)$$

Result:

$$17162$$

17162

((((1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1))))))^1/2-5

Input:

$$\sqrt{1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)}-5$$

Result:

$$\sqrt{17162}-5$$

Decimal approximation:

126.0038167382920183596976122678896766203130137141282687343...

126.0038167... result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and in the range of Higgs boson mass

((((1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1))))))^1/20

Input:

$$\sqrt[20]{1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)}$$

Result:

$$\sqrt[20]{17162}$$

Decimal approximation:

1.628277399402211384450131461046359295146939231331182584246...

1.6282773994.....

1/10^27*((47-4)/10^3+((((1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)))))^1/20))

Input:

$$\frac{1}{10^{27}}\left(\frac{47-4}{10^3}+\sqrt[20]{1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)}\right)$$

Result:

$$\frac{\frac{43}{1000}+\sqrt[20]{17\,162}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

Decimal approximation:

$1.6712773994022113844501314610463592951469392313311825... \times 10^{-27}$

$1.671277399...*10^{-27}$ result practically equal to the value of the formula:

$m_{p'} = 2 \times \frac{\eta}{R} m_P = 1.6714213 \times 10^{-24}$ gm

that is the holographic proton mass (N. Haramein)

Alternate forms:

$$\frac{43+1000\sqrt[20]{17\,162}}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

$$\frac{43}{1\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}+\frac{\sqrt[20]{8581}}{500\,000\,000\,000\,000\,000\,000\,000\,000\times 2^{19/20}}$$

And

Input:

$$\frac{1}{\sqrt[20]{1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)}}$$

Result:

$$\frac{1}{\sqrt[20]{17\,162}}$$

Decimal approximation:

0.614145968228220491233669077285673390147806350932965683522...

0.6141459682....

And:

((((1/((((1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)))))^1/20))))^1/32

Input:

$$\sqrt[32]{\frac{1}{\sqrt[20]{1+1+33(1+1)-99(1+1)+1529(1+1)-1683(1+1)+8800(1+1)}}}$$

Result:

$$\frac{1}{\sqrt[640]{17162}}$$

Decimal approximation:

0.984880384064819231902829081034315305072662914498128129720...

0.984880384.... 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 $\mathbf{0.989117352243 = \phi}$

Now, we have that:

THEOREM

If $P = \dfrac{f(-q)f(-q^7)}{q^{8/3}f(-q^9)f(-q^{63})}$ *and* $Q = \dfrac{f(-q)f(-q^{63})}{q^{-2}f(-q^9)f(-q^7)}$ *then*

$$Q^4 + \frac{1}{Q^4} - 14\left(Q^3 + \frac{1}{Q^3}\right) + 28\left(Q^2 + \frac{1}{Q^2}\right) + 7\left(Q + \frac{1}{Q}\right) = P^3 + \frac{9^3}{P^3}$$
$$+ 7\left(\sqrt{P^3} + \frac{27}{\sqrt{P^3}}\right)\left[\left(\sqrt{Q^3} + \frac{1}{\sqrt{Q^3}}\right) - \left(\sqrt{Q} + \frac{1}{\sqrt{Q}}\right)\right] + 98. \qquad (98)$$

For P = Q = 2, we obtain:

8+(9^3/8)+7((((sqrt(8)+(((27/(sqrt(8)))))*((((sqrt(8)+1/(sqrt(8))))-(((sqrt(2)+1/(sqrt(2))))))+98

Input:

$$8 + \frac{9^3}{8} + 7\left(\sqrt{8} + \frac{27}{\sqrt{8}}\left(\left(\left(\sqrt{8} + \frac{1}{\sqrt{8}}\right) - \left(\sqrt{2} + \frac{1}{\sqrt{2}}\right)\right) + 98\right)\right)$$

Result:

$$\frac{793}{8} + 7\left(2\sqrt{2} + \frac{27\left(98 - \frac{1}{2\sqrt{2}} + \sqrt{2}\right)}{2\sqrt{2}}\right)$$

Decimal approximation:

6738.314890441839954159443279591942725916841025188235325869...

6738.31489…

Alternate forms:

$$\frac{1}{2}\left(340 + 9289\sqrt{2}\right)$$

$$170 + \frac{9289}{\sqrt{2}}$$

$$\frac{9289\sqrt{2}}{2} + 170$$

Minimal polynomial:

$$2x^2 - 680x - 86\,227\,721$$

(((((((8+(9^3/8)+7((((sqrt(8)+(((27/(sqrt(8)))))*((((sqrt(8)+1/(sqrt(8))))-(((sqrt(2)+1/(sqrt(2))))))+98)))))))))))^1/3 * (2Pi*2*0.5269391135)

Where 0.5269391135 is the result of the following Ramanujan continued fraction:

$$2\int_0^\infty \frac{t^2\,dt}{e^{\sqrt{3}t}\sinh t} = \cfrac{1}{1+\cfrac{1^3}{1+\cfrac{1^3}{3+\cfrac{2^3}{1+\cfrac{2^3}{5+\cfrac{3^3}{1+\cfrac{3^3}{7+\dots}}}}}}} \approx 0.5269391135$$

Input interpretation:

$$\sqrt[3]{8+\frac{9^3}{8}+7\left(\sqrt{8}+\frac{27}{\sqrt{8}}\left(\left(\left(\sqrt{8}+\frac{1}{\sqrt{8}}\right)-\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)\right)+98\right)\right)}\,(2\pi\times 2\times 0.5269391135)$$

Result:

125.0702644...

125.0702644… result very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0

Series representations:

$$\sqrt[3]{8+\frac{9^3}{8}+7\left(\sqrt{8}+\frac{27\left(\left(\left(\sqrt{8}+\frac{1}{\sqrt{8}}\right)-\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)\right)+98\right)}{\sqrt{8}}\right)}\ 2\,(\pi\, 2\times 0.526939)=$$

$$2.10776\,\pi\left(\frac{793}{8}+7\left(\left(\left(27\left(98+\sum_{k=0}^{\infty}\frac{(-1)^{1+k}\left(-\frac{1}{2}\right)_k\sqrt{z_0}\left((2-z_0)^k-(8-z_0)^k\right)z_0^{-k}}{k!}-\right.\right.\right.\right.\right.$$

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

$$\left.\left.\frac{1}{\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(8-z_0)^k z_0^{-k}}{k!}}\right)\right)\Big/$$

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

$$\left.\left.\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(8-z_0)^k z_0^{-k}}{k!}\right)\right)\hat{}$$

$(1/3)$ for not $((z_0\in\mathbb{R}$ and $-\infty<z_0\le 0))$

$$\sqrt[3]{8+\frac{9^3}{8}+7\left(\sqrt{8}+\frac{27\left(\left(\left(\sqrt{8}+\frac{1}{\sqrt{8}}\right)-\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)\right)+98\right)}{\sqrt{8}}\right)}\;2\,(\pi\,2\times 0.526939)=$$

$$2.10776\,\pi\left(\frac{793}{8}+7\left(\exp\left(i\,\pi\left\lfloor\frac{\arg(8-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(8-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\right.\right.$$

$$\left(27\left(98-\frac{1}{\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\,\sum_{k=0}^{\infty}\frac{(-1)^k\,(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}+\right.\right.$$

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

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

$$\left.\left.\left.(8-x)^k\exp\left(i\,\pi\left\lfloor\frac{\arg(8-x)}{2\,\pi}\right\rfloor\right)\right)\left(-\frac{1}{2}\right)_k\sqrt{x}\right)\right)\Big/$$

$$\left.\left.\left.\left(\exp\left(i\,\pi\left\lfloor\frac{\arg(8-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(8-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\right)\right)\hat{}$$

$(1/3)$ for ($x \in \mathbb{R}$ and $x < 0$)

$$\sqrt[3]{8+\frac{9^3}{8}+7\left(\sqrt{8}+\frac{27\left(\left(\left(\sqrt{8}+\frac{1}{\sqrt{8}}\right)-\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)\right)+98\right)}{\sqrt{8}}\right)}\ 2\,(\pi\, 2\times 0.526939) = 2.10776\,\pi$$

$$\left(\frac{793}{8}+7\left(\left(\frac{1}{z_0}\right)^{1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor} z_0^{1/2+1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (8-z_0)^k z_0^{-k}}{k!}+\right.\right.$$
$$\left(27\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor} z_0^{-1/2-1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor}\right.$$
$$\left(98-\frac{\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor} z_0^{-1/2-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}}+\right.$$
$$\frac{\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor} z_0^{-1/2-1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (8-z_0)^k z_0^{-k}}{k!}}+$$
$$\sum_{k=0}^{\infty}\frac{1}{k!}(-1)^{1+k}\left(-\frac{1}{2}\right)_k z_0^{1/2-k}$$
$$\left((2-z_0)^k\left(\frac{1}{z_0}\right)^{1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor} z_0^{1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor}-\right.$$
$$\left.\left.\left.(8-z_0)^k\left(\frac{1}{z_0}\right)^{1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor} z_0^{1/2\lfloor \arg(8-z_0)/(2\pi)\rfloor}\right)\right)\right)\Big/$$
$$\left.\left.\left.\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (8-z_0)^k z_0^{-k}}{k!}\right)\right)\right)\right)\hat{}\ (1/3)$$

And:

(-64*11)/(1+0.5957823226)-21+
[8+(9^3/8)+7((((sqrt(8)+(((27/(sqrt(8)))))*((((sqrt(8)+1/(sqrt(8))))-
(((sqrt(2)+1/(sqrt(2))))))+98]

Where 11 is a Lucas number and 0.5957823226 is the following Ramanujan mock theta function:

$$0.449329 + 0.449329^3\,(1 + 0.449329) + 0.449329^6\,(1 + 0.449329)\left(1 + 0.449329^2\right) + 0.449329^{10}\,(1 + 0.449329)\left(1 + 0.449329^2\right)\left(1 + 0.449329^3\right)$$

$$= 0.59578232261912948582452617959420562232940854029707742891\ldots$$

$\boldsymbol{\psi(q)}$ **= 0.5957823226...**

Input interpretation:

$$\frac{-64\times 11}{1+0.5957823226} - 21 + \left(8 + \frac{9^3}{8} + 7\left(\sqrt{8} + \frac{27}{\sqrt{8}}\left(\left(\left(\sqrt{8} + \frac{1}{\sqrt{8}}\right) - \left(\sqrt{2} + \frac{1}{\sqrt{2}}\right)\right) + 98\right)\right)\right)$$

Result:

6276.15196363...

6276.151963.... result practically equal to the rest mass of Charmed B meson 6275.6

Appendix

From:

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

We note that:

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

Hence

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

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

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

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 and 4096 = 64^2

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Berndt, B. et al. "**The Rogers–Ramanujan Continued Fraction**"