On some Ramanujan's formulas: mathematical connections with several equations inherent some topics of String Cosmology and Black Holes Physics. V

Michele Nardelli[1], **Antonio Nardelli**

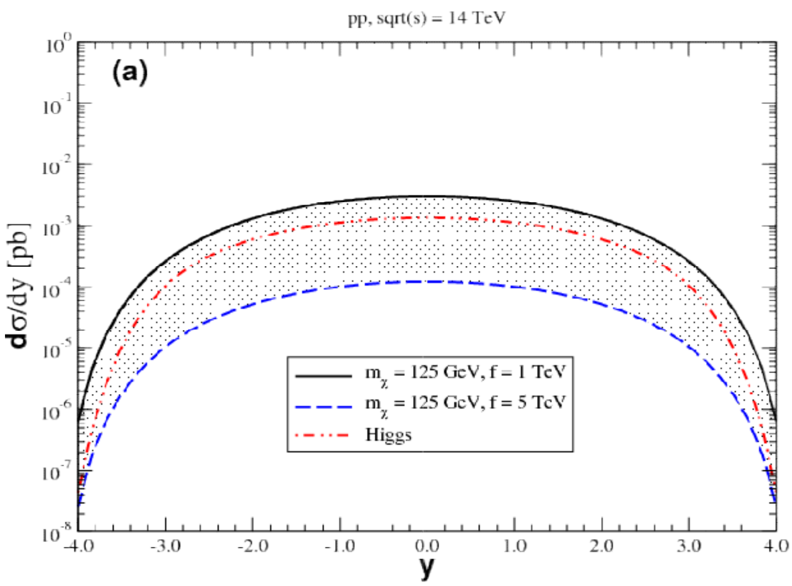
Abstract

In this paper we have described several Ramanujan's equations and obtained some mathematical connections with various formulas concerning different topics of String Cosmology and Black Holes Physics.(update version 23/02/20)

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

https://www.pinterest.it/pin/742319951051634216/?lp=true

http://inspirehep.net/record/1341042/plots



(Color online)

Rapidity distribution for the dilaton production in \pom\pom interactions considering (a) pp and (b) PbPb collisions at LHC energies. The corresponding predictions for the SM Higgs production are also presented for comparison.

From:

SUPERSTRING THEORY

Volume 2

Loop amplitudes, anomalies and phenomenology

MICHAEL B. GREEN
Queen Mary College, University of London

JOHN H. SCHWARZ
California Institute of Technology

EDWARD WITTEN
Princeton University

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

First published 1987
Reprinted 1987

Printed in the United States of America

8.2 Closed-String One-Loop Amplitudes

From

8.2.4 Analysis of Divergences

we have:

The next term in the expansion of the integrand gives a divergence of the form $\int d\epsilon/\epsilon$ corresponding to the propagation of a massless dilaton, rather than a tachyon, down the long neck of fig. 8.22*a*. The coefficient of this divergence,

$$\int_F d^2\tau (\mathrm{Im}\ \tau)^{-14} e^{4\pi \mathrm{Im}\ \tau} |f(e^{2\pi i\tau})|^{-48}, \qquad (8.2.47)$$

should be pro -tional to the coupling of a dilaton to a toroidal world sheet, *i.e.*, to \ue dilaton one-loop expectation value. T\is can be seen

If we took the integration region in (8.2.56) to be the semi-infinite strip consisting of $0 < \mathrm{Im}\tau < \infty, -1/2 \leq \mathrm{Re}\tau \leq 1/2$, then (8.2.56) would correspond rather closely to (8.2.53). In fact, however, this is the wrong choice. The integrand of (8.2.56) is easily seen to be modular invariant by the same reasoning as we used above for the case of the dilaton expectation value. The τ integration region should therefore be restricted to cover a single fundamental region of the modular group shown in fig. 8.21. The restriction to a single fundamental region does not correspond to any simple operation that one might imagine in field theory. Roughly speaking, the exclusion of the region near $\mathrm{Im}\ \tau = 0$ ($|z| \sim 1$) is tantamount to cutting off the ultraviolet contributions to the vacuum energy of the component string states. The cosmological constant is still infrared divergent in the bosonic string theory due to the tachyon contribution, but the presence of the ultraviolet cut off is a significant departure from the expression obtained in point-particle theories.

The expression in (8.2.56) is proportional to the dilaton expectation value, (8.2.47). This relationship between the cosmological constant and the dilaton expectation value is the simplest example of a general phenomenon. The addition of a zero-momentum dilaton to an arbitrary process gives a result that is proportional to the derivative of the amplitude without the soft dilaton with respect to the string tension. This is closely related to a scaling behavior discussed in §13.2.

From:

$$\begin{aligned}\Lambda &= -\frac{1}{2}\int \frac{d^{26}p}{(2\pi)^{26}}\int d^2\tau \frac{1}{\mathrm{Im}\ \tau} e^{\pi(4-\alpha' p^2)\mathrm{Im}\ \tau}\mathrm{tr}\left(z^N \bar{z}^{\tilde{N}}\right) \\ &= -\frac{1}{2}\left(\frac{1}{4\pi^2\alpha'}\right)^{13}\int d^2\tau\, (\mathrm{Im}\ \tau)^{-14}\, e^{4\pi\mathrm{Im}\ \tau}\left|f(e^{2i\pi\tau})\right|^{-48}.\end{aligned} \qquad (8.2.56)$$

i.e.

$$-\frac{1}{2}\left(\frac{1}{4\pi^2\alpha'}\right)^{13}\int d^2\tau\, (\mathrm{Im}\ \tau)^{-14}\, e^{4\pi\mathrm{Im}\ \tau}\left|f(e^{2i\pi\tau})\right|^{-48}$$

For α' = 0.9798 GeV^{-2} , we obtain:

-1/2 (1/(4Pi^2*0.9798 GeV^-2))^13 * integrate (((d^2 x (i*x)^(-14)(exp(4Pi) *f((exp(2Pi)))^-48))))

Input interpretation:

$$-\frac{1}{2}\left(\frac{1}{4\times\pi^2\times 0.9798\text{ GeV}^{-2}\text{ (reciprocal gigaelectronvolts squared)}}\right)^{13}\int d^2\,x\times\frac{\frac{\exp(4\pi)}{f(\exp(2\pi))^{48}}}{(i\,x)^{14}}\,dx$$

i is the imaginary unit

Result:

$$\frac{d^2 - 2.753\times 10^{-17}\text{ GeV}^{26}\text{ (gigaelectronvolts to the 26)}}{f(e^{2\pi})^{48}\,x^{12}}$$

Input interpretation:

$$\frac{d^2 - 2.753\times 10^{-17}\text{ GeV}^{26}\text{ (gigaelectronvolts to the 26)}}{f(e^{2\pi})^{48}\,x^{12}}$$

Result:

$$\frac{-2.753\times 10^{-17}\text{ GeV}^{26}\text{ (gigaelectronvolts to the 26)} + d^2}{f(e^{2\pi})^{48}\,x^{12}}$$

nput interpretation:

GeV^{26} (gigaelectronvolt to the 26) = (GeV (gigaelectronvolt)) × 10^{26}

Result:

1 GeV^{26} (gigaelectronvolt to the 26) = 1 × 10^{26} GeV (gigaelectronvolts)

(-2.753×10^-17 10^26)/((e^(2 π))^48 1^12)

Input interpretation:

$$\frac{-2.753\times 10^{-17}\times 10^{26}}{(e^{2\pi})^{48}\times 1^{12}}$$

Result:

$-2.88188\ldots\times 10^{-122}$

-2.88188…*10^{-122}

(-2.753×10^-17 * 1* 10^26)/(i^2(e^(2 π))^48)

Input interpretation:

$$\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}}$$

i is the imaginary unit

Result:

$2.88188\ldots\times 10^{-122}$

2.88188…*10^{-122} result practically equal to the value of Cosmological Constant in Planck units (2.888×10^{-122})

We have that:

integrate (((d^2 x (i*x)^(-14)(exp(4Pi) *f((exp(2Pi)))^-48))))

Indefinite integral:

$$\int \frac{d^2\, x \exp(4\pi)}{(i\,x)^{14}\, f(\exp(2\pi))^{48}}\,dx = \frac{e^{4\pi}\, d^2}{12\, f\left(e^{2\pi}\right)^{48}\, x^{12}} + \text{constant}$$

i is the imaginary unit

(d^2 e^(4 π))/(12 x^12 f(e^(2 π))^48)

Input:

$$\frac{d^2\, e^{4\pi}}{12\, x^{12}\, f\left(e^{2\pi}\right)^{48}}$$

Root:

$x \neq 0\,,\quad d = 0$

Properties as a real function:

Domain

$\{x \in \mathbb{R} : f\left(e^{2\pi}\right)^2 x^2 > 0\}$

Range

$$\{y \in \mathbb{R} : (d \neq 0 \text{ and } d = 0 \text{ and } f(e^{2\pi}) \neq 0)$$
$$\text{or } \left(d \neq 0 \text{ and } 0 < y < \frac{1}{\operatorname{sgn}(f(e^{2\pi}))^{48}} \infty \text{ and } f(e^{2\pi}) \neq 0\right)$$
$$\text{or } (y = 0 \text{ and } d = 0 \text{ and } f(e^{2\pi}) \neq 0) \text{ or}$$
$$\left(y = 0 \text{ and } 0 < y < \frac{1}{\operatorname{sgn}(f(e^{2\pi}))^{48}} \infty \text{ and } f(e^{2\pi}) \neq 0\right)\}$$

Parity

even

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

$\operatorname{sgn}(x)$ is the sign of x

Derivative:

$$\frac{\partial}{\partial x}\left(\frac{e^{4\pi} d^2}{12 f(e^{2\pi})^{48} x^{12}}\right) = -\frac{e^{4\pi} d^2}{f(e^{2\pi})^{48} x^{13}}$$

Indefinite integral:

$$\int \frac{d^2 e^{4\pi}}{12 x^{12} f(e^{2\pi})^{48}} \, dx = -\frac{e^{4\pi} d^2}{132 f(e^{2\pi})^{48} x^{11}} + \text{constant}$$

Limit:

$$\lim_{x \to \pm\infty} \frac{d^2 e^{4\pi}}{12 x^{12} f(e^{2\pi})^{48}} = 0$$

Definite integral over a square of edge length 2 L:

$$\int_{-L}^{L} \int_{-L}^{L} \frac{d^2 e^{4\pi}}{12 x^{12} f(e^{2\pi})^{48}} \, dx \, dd = -\frac{e^{4\pi}}{99 f(e^{2\pi})^{48} L^8}$$

From which:

(e^(4 π))/(12 (e^(2 π))^48)

Input:

$$\frac{e^{4\pi}}{12 (e^{2\pi})^{48}}$$

Exact result:

$$\frac{e^{-92\pi}}{12}$$

Decimal approximation:

$2.5014636741028838635105822478381919748528533511734 74... \times 10^{-127}$

2.5014636741…*10^-127

Property:

$\frac{e^{-92\pi}}{12}$ is a transcendental number

Alternative representations:

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{e^{-4 i \log(-1)}}{12\left(e^{-2 i \log(-1)}\right)^{48}}$$

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{\exp^{4\pi}(z)}{12 \exp^{2\pi}(z)^{48}} \quad \text{for } z = 1$$

Series representations:

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{1}{12} e^{-368 \sum_{k=0}^{\infty} (-1)^k/(1+2k)}$$

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{1}{12} \left(\sum_{k=0}^{\infty} \frac{1}{k!}\right)^{-92\pi}$$

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{1}{12} \left(\frac{1}{\sum_{k=0}^{\infty} \frac{(-1)^k}{k!}}\right)^{-92\pi}$$

Integral representations:

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{1}{12} e^{-368 \int_0^1 \sqrt{1-t^2}\, dt}$$

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{1}{12} e^{-184 \int_0^1 1/\sqrt{1-t^2}\, dt}$$

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} = \frac{1}{12} e^{-184 \int_0^{\infty} 1/(1+t^2)\, dt}$$

From the ratio of the two solution, we obtain:

((((e^(4 π))/(12 (e^(2 π))^48))))*1/ ((((-2.753×10^-17 * 1* 10^26)/(i^2(e^(2 π))^48))))

Input interpretation:

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}}}$$

i is the imaginary unit

Result:

$8.67996... \times 10^{-6}$

$8.67996...*10^{-6}$

Or:

((((-2.753×10^-17 * 1* 10^26)/(i^2(e^(2 π))^48)))) 1/ ((((e^(4 π))/(12 (e^(2 π))^48))))

Input interpretation:

$$\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}}}$$

i is the imaginary unit

Result:

115207.842079720375066287696337415709611086038391864255006...

115207.84207972...

From which:

(((((((-2.753×10^-17 * 1* 10^26)/(i^2(e^(2 π))^48)))) 1/ ((((e^(4 π))/(12 (e^(2 π))^48)))))))^1/24-7*1/10^3

Input interpretation:

$$\sqrt[24]{\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}}}} - 7\times\frac{1}{10^3}$$

i is the imaginary unit

Result:

1.618156...

1.618156... result that is a very good approximation to the value of the golden ratio 1.61803398...

Dividing by 18, that is a Lucas number, the previous expression

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}}}$$

we obtain:

-(((((((e^(4 π))/(12 (e^(2 π))^48))))*1/ ((((-2.753×10^-17 * 1* 10^26)/(i^2(e^(2 π))^48)))))))/18

Input interpretation:

$$-\frac{1}{18}\left(\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}}}\right)$$

i is the imaginary unit

Result:

$-4.82220... \times 10^{-7}$

-4.82220…*10^{-7}

We note that:

From:

Black Hole Dynamics in Einstein-Maxwell-Dilaton Theory

Eric W. Hirschmann, Luis Lehner, Steven L. Liebling and Carlos Palenzuela

arXiv:1706.09875v1 [gr-qc] 29 Jun 2017

we have:

values. This behavior can be extracted analytically from the solution presented in Appendix § A (neglecting, for the moment, the asymptotic value of the dilaton) and from which the scalar charge can be calculated as

$$\phi_1 = \frac{\alpha_0 Q_e^2}{M} \frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}} . \qquad (38)$$

The behavior at small α_0 extracted from Eq. (38) is $\phi_1 \approx \alpha_0 Q_e^2/(2M)$ while for large values $\phi_1 \rightarrow |Q_e|$. The numerical solutions obtained for $\alpha_0 \lesssim 5000$ are in excellent agreement with this expression while a lower than expected scalar charge is obtained above this value of α_0. We note however that numerical simulations be-

For

$q_e \equiv Q_e/M = 10^{-3}$ $\quad q_e = 0.001$

-((1382*(0.001)^2)) * 1/sqrt(((1+(1+(1382^2-1) *(0.001)^2))))

where 1382 is very near to the rest mass of Sigma baryon

Input:

$$-(1382\times 0.001^2)\times \frac{1}{\sqrt{1+(1+(1382^2-1)\times 0.001^2)}}$$

Result:

-0.000698914...

6.98914 * 10^{-4}

We calculate Q, for M = 13.12806e+39 and α_0 = 5000 , from

$$\phi_1 = \frac{\alpha_0 Q_e^2}{M} \frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}} .$$

We obtain:

((5000*(x)^2))/(13.12806e+39) * 1/ ((1+sqrt((((((1+(5000^2-1) *(x)^2))/(13.12806e+39)^2)))))) = 4.82e-7

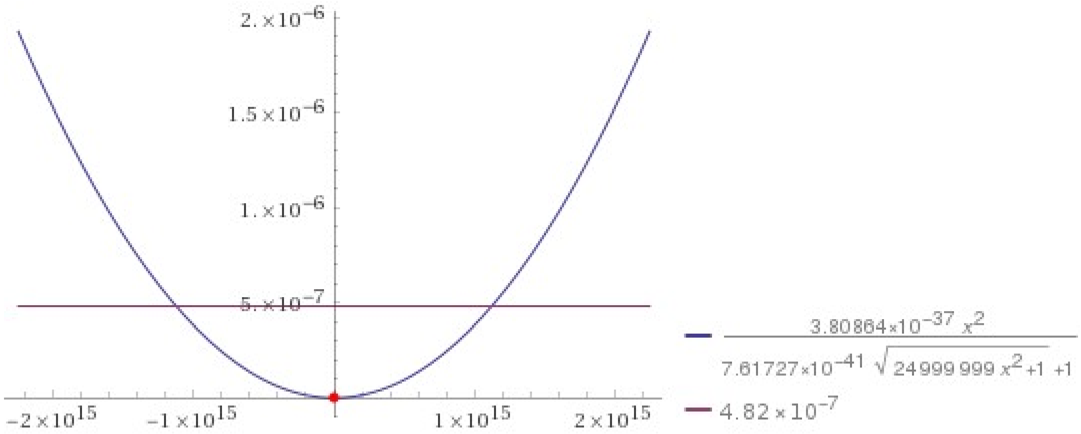
Input interpretation:

$$\frac{5000\,x^2}{13.12806\times10^{39}}\times\frac{1}{1+\sqrt{\frac{1+(5000^2-1)x^2}{(13.12806\times10^{39})^2}}}=4.82\times10^{-7}$$

Result:

$$\frac{3.80864\times10^{-37}\,x^2}{7.61727\times10^{-41}\sqrt{24\,999\,999\,x^2+1}+1}=4.82\times10^{-7}$$

Plot:



Alternate form:

$$\frac{3.80864\times10^{-37}\,x^2}{7.61727\times10^{-41}\sqrt{24\,999\,999\,x^2+1}+1}=4.82\times10^{-7}$$

Alternate form assuming x is positive:

$$3.80864\times10^{-37}\,x^2=3.67152\times10^{-47}\sqrt{24\,999\,999\,x^2+1}+4.82\times10^{-7}$$

Solutions:

$x\approx-1.12496\times10^{15}$

$x\approx1.12496\times10^{15}$

$1.12496*10^{15}$

Thence Q = 1.12496e+15

Inserting the value of Q in the following expression, we obtain:

((5000*(1.12496e+15)^2))/(13.12806e+39) * 1/ ((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))

Input interpretation:

$$\frac{5000\,(1.12496\times 10^{15})^2}{13.12806\times 10^{39}}\times\frac{1}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times 10^{15})^2}{(13.12806\times 10^{39})^2}}}$$

Result:

$4.81996... \times 10^{-7}$

$4.81996...*10^{-7} = \phi_1$ (scalar charge)

From:

pling and scalar charge. The coupling value is straightforward, but the black hole charge is chosen as the charge of individual black holes in isolation. Thus the charges for equal mass binaries are chosen as: $\phi_1 = \{-4.8\times 10^{-7}, -4\times 10^{-4}, -6.9\times 10^{-4}\}$ and for unequal mass binaries (m_1, m_2): $\phi_1 = \{\,(-3,-2)\times 10^{-7}, (-2.4,-1.6)\times 10^{-4}, (-4.2,-2.7)\times 10^{-4}\}$ for $\alpha_0 = \{1, 10^3, 3\times 10^3\}$ respectively (which are well approximated by the analytical expression Eq. 38).

We observe that the value of $\phi_1 = -4.8\times 10^{-7}$ is practically equal to the result -4.82220…*10^{-7} that we have obtained previously

Now, we obtain also:

[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1)*(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]^1/4096

Input interpretation:

$$\sqrt[4096]{\frac{\frac{5000\,(1.12496\times 10^{15})^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times 10^{15})^2}{(13.12806\times 10^{39})^2}}}}$$

Result:

0.99645519...

0.99645519... 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:

2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+11+1/golden ratio

Input interpretation:

$$2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\left(1.12496\times 10^{15}\right)^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+\left(5000^2-1\right)\left(1.12496\times 10^{15}\right)^2}{\left(13.12806\times 10^{39}\right)^2}}}\right)+11+\frac{1}{\phi}}$$

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

ϕ is the golden ratio

Result:

139.618...

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

2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]-Pi+1/golden ratio

Input interpretation:

$$2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\left(1.12496\times 10^{15}\right)^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+\left(5000^2-1\right)\left(1.12496\times 10^{15}\right)^2}{\left(13.12806\times 10^{39}\right)^2}}}\right)-\pi+\frac{1}{\phi}}$$

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

ϕ is the golden ratio

Result:

125.476...

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

We have also:

2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+7

Input interpretation:

$$2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\,(1.12496\times 10^{15})^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times 10^{15})^2}{(13.12806\times 10^{39})^2}}}\right)}+7$$

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

Result:

135.000...

135

2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+7+3

Input interpretation:

$$2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\,(1.12496\times 10^{15})^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times 10^{15})^2}{(13.12806\times 10^{39})^2}}}\right)}+7+3$$

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

Result:

138.000...

138

2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+47-3

Input interpretation:

$$2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\,(1.12496\times10^{15})^2}{13.12806\times10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times10^{15})^2}{(13.12806\times10^{39})^2}}}\right)}+47-3$$

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

Result:

172.000...

172

Thence:

[2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+7]^3

Input interpretation:

$$\left(2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\,(1.12496\times10^{15})^2}{13.12806\times10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times10^{15})^2}{(13.12806\times10^{39})^2}}}\right)}+7\right)^3$$

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

Result:

$2.46037... \times 10^6$

2.46037×10^6

[2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+7+3]^3

Input interpretation:

$$\left(2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\,(1.12496\times 10^{15})^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times 10^{15})^2}{(13.12806\times 10^{39})^2}}}\right)}+7+3\right)^3$$

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

Result:

$2.62807... \times 10^6$

2.62807×10^6

[2sqrt[log base0.99645519[((((((5000*(1.12496e+15)^2))/(13.12806e+39))))) / ((((((1+sqrt((((((1+(5000^2-1) *(1.12496e+15)^2))/(13.12806e+39)^2))))))))))]]+47-3]^3-1

Input interpretation:

$$\left(2\sqrt{\log_{0.99645519}\left(\frac{\frac{5000\,(1.12496\times 10^{15})^2}{13.12806\times 10^{39}}}{1+\sqrt{\frac{1+(5000^2-1)(1.12496\times 10^{15})^2}{(13.12806\times 10^{39})^2}}}\right)}+47-3\right)^3-1$$

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

Result:

$5.08844... \times 10^6$

5.08844×10^6

From:

$$135^3 + 138^3 = 172^3 - 1$$

We have: $2.46037 \times 10^6 + 2.62807 \times 10^6 = 5.08844\times10^6$

From Wikipedia

Sagittarius A * (abbreviated as Sgr A *) is a very compact and bright source of radio waves, located in the center of the Milky Way, part of the large structure known as Sagittarius A. Sgr A * is the point where there is a **supermassive black hole, characteristic component of the centers of many elliptical and spiral galaxies.** Sagittarius A * would have a mass of about 4 million times that of the Sun and, being in the center of our galaxy, would constitute the celestial body around which all the stars of the Milky Way, including ours, make their revolutionary motion.

Mass = 4.31×10^6 M⊙ (Sun mass = 1.9891×10^{30} kg) = $8.573021 * 10^{36}$

From:

On the charge of the Galactic centre black hole

Michal Zaja_cek1;2;3?, Arman Tursunov4, Andreas Eckart2;1, and Silke Britzen1

arXiv:1808.07327v1 [astro-ph.GA] 22 Aug 2018

"We propose a novel observational test based on the presence of the bremsstrahlung surface brightness decrease, which is more sensitive for smaller unshielded electric charges than the black-hole shadow size. Based on this test, the current upper observational limit on **the charge of Sgr A* is $\leq 3 * 10^8$ C**"

Furthermore:

Note that in the limit $\alpha_0 \to 0$ the solution corresponds to that of a charged RN black hole. As $\alpha_0 \to \infty$, the solution is simply an uncharged Schwarzschild black hole for which the Maxwell field is zero and the dilaton is a constant. By extension we expect (and show below) that for the rotating solutions α_0 interpolates between the charged Kerr-Newman black hole and the uncharged Kerr solution, the latter unadorned by scalar or vector fields. One way of understanding the $\alpha_0 \to \infty$ limit is that the gravitational sector decouples from the matter sector (see, for example, [32]). In this limit, regardless of the behavior of the dilaton and Maxwell field, the gravitational solutions are just those of GR, such as Schwarzschild and Kerr black holes.

For Sagittarius A* , for $\alpha_0 = 5*10^{13}$, we obtain:

((5e+13*(x)^2))/(8.573021e+36) * 1/ ((1+sqrt((((((1+(5e+13^2-1) *(x)^2))/(8.573021e+36)^2)))))) = 4.82e-7

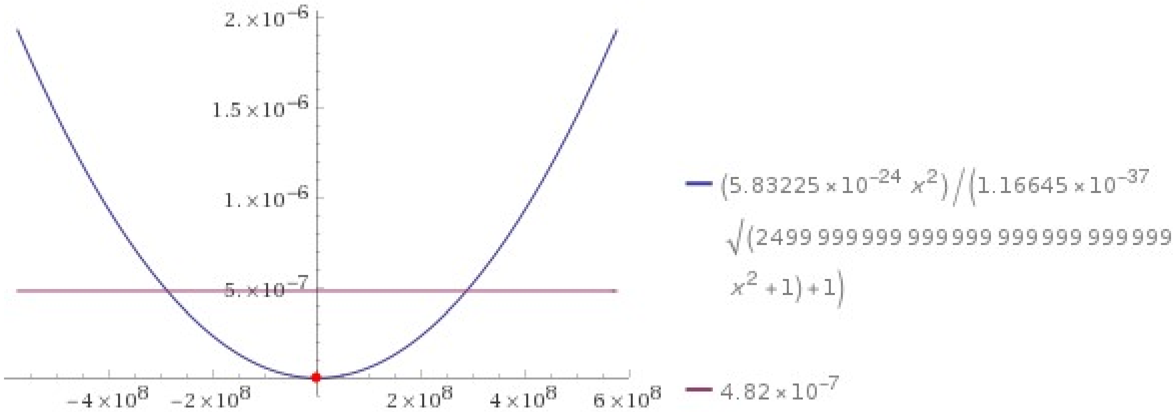
Input interpretation:

$$\frac{5\times 10^{13}\,x^2}{8.573021\times 10^{36}}\times\frac{1}{1+\sqrt{\frac{1+((5\times 10^{13})^2-1)x^2}{(8.573021\times 10^{36})^2}}} = 4.82\times 10^{-7}$$

Result:

$$\frac{5.83225\times 10^{-24}\,x^2}{1.16645\times 10^{-37}\sqrt{2\,499\,999\,999\,999\,999\,999\,999\,999\,999\,x^2+1}+1} = 4.82\times 10^{-7}$$

Plot:



Alternate form:

$$\frac{5.83225\times 10^{-24}\,x^2}{1.16645\times 10^{-37}\sqrt{2\,499\,999\,999\,999\,999\,999\,999\,999\,999\,x^2+1}+1} = 4.82\times 10^{-7}$$

Alternate form assuming x is positive:

$$5.83225\times 10^{-24}\,x^2 = 5.62229\times 10^{-44}\sqrt{2\,499\,999\,999\,999\,999\,999\,999\,999\,999\,x^2+1}+4.82\times 10^{-7}$$

Solutions:

$x \approx -2.87479 \times 10^8$

$x \approx 2.87479 \times 10^8$

$2.87479*10^8$

Thence: $Q = 2.87479 *10^8$

We obtain:

((5e+13*(2.87479e+8)^2))/(8.573021e+36) * 1/ ((1+sqrt((((((1+(5e+13^2-1) *(2.87479e+8)^2))/(8.573021e+36)^2))))))

Input interpretation:

$$\frac{5\times 10^{13}\,(2.87479\times 10^8)^2}{8.573021\times 10^{36}}\times \frac{1}{1+\sqrt{\frac{1+((5\times 10^{13})^2-1)(2.87479\times 10^8)^2}{(8.573021\times 10^{36})^2}}}$$

Result:

$4.82001... \times 10^{-7}$

$4.82001...*10^{-7} = \phi_1$ (scalar charge)

From:

Higgs Inflation

Javier Rubio - Institut für Theoretische Physik, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany - REVIEW - published: 22 January 2019 - doi: 10.3389/fspas.2018.00050 - Frontiers in Astronomy and Space Sciences | www.frontiersin.org 1 January 2019 | Volume 5 | Article 50

$$\phi_E = \frac{M_P}{2\sqrt{a}} \text{arcsinh}(\sqrt{32a}), \qquad (4.9)$$

the inflaton value at the end of inflation ($\epsilon(\phi_{end}) \equiv 1$), with $\phi_E = \sqrt{3/2}\,\text{arcsinh}(4/\sqrt{3})\,M_P$ corresponding to the $\xi \to \infty$ limit and $\phi_E = 2\sqrt{2}\,M_P$ to the end of inflation in a minimally coupled $\lambda\phi^4$ theory. A relation between the non-minimal coupling ξ, the self-coupling λ and the number of e-folds $\bar{N}_*$ can be obtained by taking into account the amplitude of the observed power spectrum in Equation (2.39),

$$\xi \simeq 3.8 \times 10^6 \bar{N}_*^2 \lambda\,. \qquad (4.10)$$

A simple inspection of Equation (4.7) reveals that the predicted tensor-to-scalar ratio in Palatini Higgs inflation is within the reach of current or future experiments (Matsumura et al., 2016) only if $\xi \lesssim 10$, which, assuming $\bar{N} \simeq 59$, requires a very small coupling $\lambda \lesssim 10^{-9}$. For a discussion of unitarity violations in the Palatini formulation, see Bauer and Demir (2011).

For the reduced mass Planck 4.341×10^{-9} kg, and the above data, we obtain from (4.9) :

(4.341e-9) / ((((2*((((3.8e+6)*59^2*(10^-9))))^1/2)))) * asinh (sqrt(((32*(3.8e+6)*59^2*(10^-9)))))

Input interpretation:

$$\frac{4.341\times10^{-9}}{2\sqrt{\frac{3.8\times10^6\times59^2}{10^9}}}\sinh^{-1}\left(\sqrt{\frac{32\times3.8\times10^6\times59^2}{10^9}}\right)$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

Result:

$2.21870... \times 10^{-9}$

$2.21870...*10^{-9}$

Multiplying the previous expression by 216 = 8 * 3^3, we obtain:

(((((4.341e-9) / ((((2*((((3.8e+6)*59^2*(10^-9))))^1/2)))) * asinh (sqrt(((32*(3.8e+6)*59^2*(10^-9)))))))))*(8*3^3)

Input interpretation:

$$\left(\frac{4.341\times10^{-9}}{2\sqrt{\frac{3.8\times10^{6}\times59^{2}}{10^{9}}}}\sinh^{-1}\left(\sqrt{\frac{32\times3.8\times10^{6}\times59^{2}}{10^{9}}}\right)\right)(8\times3^{3})$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

Result:

$4.79239\ldots\times10^{-7}$

$4.79239\ldots*10^{-7} = \phi_1$ result practically equal to the scalar charge obtained from the previous analyzed expression

$$\phi_1 = \frac{\alpha_0 Q_e^2}{M}\frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}}\,.$$

Where 216 = 27*8 = 8 * 3^3

Or:

(((((4.341e-9) / ((((2*((((3.8e+6)*59^2*(10^-9))))^1/2)))) * asinh (sqrt(((32*(3.8e+6)*59^2*(10^-9)))))))))* ((248-496*2/31)))

Input interpretation:

$$\left(\frac{4.341\times10^{-9}}{2\sqrt{\frac{3.8\times10^{6}\times59^{2}}{10^{9}}}}\sinh^{-1}\left(\sqrt{\frac{32\times3.8\times10^{6}\times59^{2}}{10^{9}}}\right)\right)\left(248-496\times\frac{2}{31}\right)$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

Result:

$4.79239... \times 10^{-7}$

$4.79239...*10^{-7} = \phi_1$ result practically equal to the scalar charge obtained from the previous analyzed expression

$$\phi_1 = \frac{\alpha_0 Q_e^2}{M} \frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}} .$$

and, for the following expression

$$\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}}}$$

we can write also:

-((((((((e^(4 π))/(12 (e^(2 π))^48))))*1/ ((((-2.753×10^-17 * 1* 10^26)/(i^2(e^(2 π))^48)))))))*1/(((3((248-496*2/31))^1/3)))

and obtain:

Input interpretation:

$$-\left(\frac{e^{4\pi}}{12\left(e^{2\pi}\right)^{48}} \times \frac{1}{\frac{-2.753\times 10^{-17}\times 1\times 10^{26}}{i^2\left(e^{2\pi}\right)^{48}}}\right) \times \frac{1}{3\sqrt[3]{248-496\times\frac{2}{31}}}$$

i is the imaginary unit

Result:

$-4.82220... \times 10^{-7}$

$-4.82220...*10^{-7} = \phi_1$ result practically equal to the scalar charge obtained from the previous analyzed expression

$$\phi_1 = \frac{\alpha_0 Q_e^2}{M} \frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}} .$$

With regard the number 216, we have the following observations.

From:

STRING THEORY VOLUME II - Superstring Theory and Beyond
JOSEPH POLCHINSKI
Institute for Theoretical Physics - © Cambridge University Press 2001, 2005
University of California at Santa Barbara

We have that:

The λ^A transform under an $SO(32)$ internal symmetry. Under the full symmetry $SO(8)_{\text{spin}} \times SO(32)$, the NS ground state is invariant, $(\mathbf{1},\mathbf{1})$. The second state in (11.2.16) is antisymmetric under $A \leftrightarrow B$, so the massless states (11.2.16) transform as $(\mathbf{8}_v, \mathbf{1}) + (\mathbf{1}, [2])$. The antisymmetric tensor representation is the adjoint of $SO(32)$, with dimension $32 \times 31/2 = \mathbf{496}$.

From 32*31/2 = 496, we can to write:

(248-216) * 31 * 1/2 = (248-27*8) * 31* 1/2

Input:

$$(248 - 216) \times 31 \times \frac{1}{2} = (248 - 27 \times 8) \times 31 \times \frac{1}{2}$$

Result:

True

Left hand side:

$$\frac{1}{2}(248 - 216)\, 31 = 496$$

Right hand side:

$$\frac{1}{2}(248 - 27 \times 8)\, 31 = 496$$

248-496*1/(31*1/2)

Input:

$$248 - 496 \times \frac{1}{31 \times \frac{1}{2}}$$

And

Input:

$$\frac{1}{31 \times \frac{1}{2}}$$

Exact result:

$$\frac{2}{31}$$

248-496*(2/31)

Input:

$$248 - 496 \times \frac{2}{31}$$

Exact result:

216

216

Now, we have that:

and α, β positive dimensionless parameters. The existence of a well-defined gravitational interactions at all field values requires the non-minimal gravitational couplings to be positive-definite, i.e. $\xi_h, \xi_\chi > 0$. In the absence of gravity, the ground state of Equation (4.11) is determined by the scale-invariant potential (4.12). For $\alpha \neq 0$ and $\beta = 0$, the vacuum manifold extends along the flat directions $h_0 = \pm\alpha\chi_0$. Any solution with $\chi_0 \neq 0$ breaks scale symmetry spontaneously and induces non-zero values for the effective Planck mass and the electroweak scale[18]. The relation between these highly hierarchical scales is set by fine-tuning $\alpha \sim v^2/M_P^2 \sim 10^{-32}$. For this small value, the flat valleys in the potential $U(h,\chi)$ are essentially aligned and we can safely approximate $\alpha \simeq 0$ for all inflationary purposes.

To compare the inflationary predictions of this model with those of the standard Higgs-inflation scenario, let us perform a Weyl rescaling $g_{\mu\nu} \rightarrow M_P^2/(\xi_h h^2 + \xi_\chi \chi^2) g_{\mu\nu}$ followed by a field redefinition (Casas et al., 2017)

$$\gamma^{-2}\Theta \equiv \frac{(1+6\xi_h)h^2 + (1+6\xi_\chi)\chi^2}{\xi_h h^2 + \xi_\chi \chi^2},$$
$$\exp\left[\frac{2\gamma\Phi}{M_P}\right] \equiv \frac{a}{\bar{a}}\frac{(1+6\xi_h)h^2 + (1+6\xi_\chi)\chi^2}{M_P^2}, \quad (4.13)$$

with

$$\gamma \equiv \sqrt{\frac{\xi_\chi}{1+6\xi_\chi}}, \quad a \equiv -\frac{\xi_h}{1+6\xi_h}, \quad \bar{a} \equiv a\left(1 - \frac{\xi_\chi}{\xi_h}\right). \quad (4.14)$$

After some algebra, we obtain a rather simple Einstein-frame action (Karananas and Rubio, 2016; Casas et al., 2017)

For $\xi_h = 3$; $\xi_\chi = 5$, we obtain:

-3/(1+6*3)

Input:

$$-\frac{3}{1+6\times 3}$$

Exact result:

$$-\frac{3}{19}$$

Decimal approximation:

−0.1578947368421052631578947368421052631578947368421052631 5...

a = -0.1578947368421....

-0.1578947368421(1-5/3)

Input interpretation:

$-0.1578947368421\left(1-\frac{5}{3}\right)$

Result:

0.105263157894733333333333333333333333333333333333333333...

Repeating decimal:

$0.1052631578947\overline{3}$ (period 1)

$\bar{a}$ = 0.10526315789473

sqrt(5/(1+6*5))

Input:

$$\sqrt{\frac{5}{1+6\times 5}}$$

Result:

$$\sqrt{\frac{5}{31}}$$

Decimal approximation:

0.4016096644512494314463216344123292336663871610215422397 12...

γ = 0.40160966445....

For $\xi_h = 3$; $\xi_\chi = 5$, $\alpha = 2$, $\chi = 4$, $h = 8$, $\gamma = 0.40160966445....$

$\bar{a}$ = 0.10526315789473 a = -0.1578947368421.... from

$$\gamma^{-2}\Theta \equiv \frac{(1+6\xi_h)h^2 + (1+6\xi_\chi)\chi^2}{\xi_h h^2 + \xi_\chi \chi^2},$$

We obtain:

((1+6*3)*8^2 + (1+6*5)*4^2) / (3*8^2 + 5*4^2)

Input:

$$\frac{(1+6\times3)\times8^2+(1+6\times5)\times4^2}{3\times8^2+5\times4^2}$$

Exact result:

$$\frac{107}{17}$$

Decimal approximation:

6.2941176470588235294117647058823529411764705882352941176470588235294117647...

6.294117647058.....

(0.40160966445)^-2 x = 6.294117647058

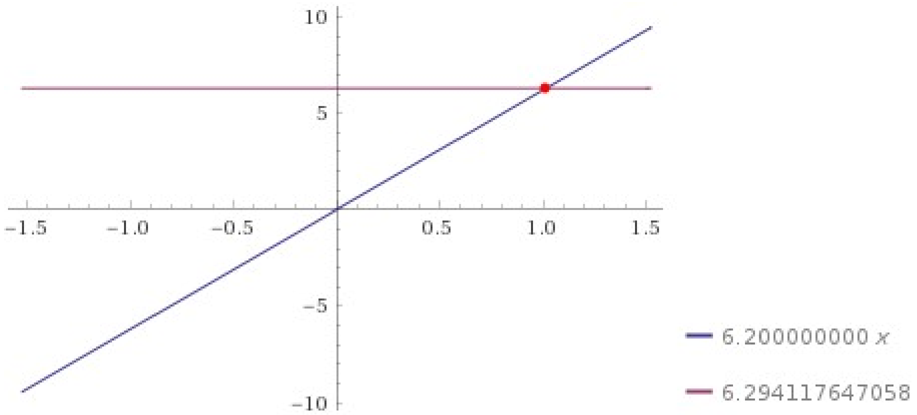
Input interpretation:

$$\frac{x}{0.40160966445^2} = 6.294117647058$$

Result:

$$6.200000000\,x = 6.294117647058$$

Plot:



Alternate form:

$6.200000000\,x - 6.294117647058 = 0$

Solution:

$x \approx 1.0151802656$

Θ = 1.0151802656

From:

$$\exp\left[\frac{2\gamma\Phi}{M_P}\right] \equiv \frac{a}{\bar{a}} \frac{(1+6\xi_h)h^2 + (1+6\xi_\chi)\chi^2}{M_P^2},$$

from the right-hand side we obtain:

(-0.1578947368421 / 0.10526315789473) ((1+6*3)*8^2+(1+6*5)*4^2)/(4.341e-9)^2

Input interpretation:

$$-\frac{0.1578947368421}{0.10526315789473} \times \frac{(1+6\times 3)\times 8^2 + (1+6\times 5)\times 4^2}{(4.341\times 10^{-9})^2}$$

Result:

$-1.362747668642853139368915165978367654356429718385116\ldots \times 10^{20}$

$-1.3627476686\ldots*10^{20}$

dividing by 10^{20} the result and changing the sign, from the above expression

$$\exp\left[\frac{2\gamma\Phi}{M_P}\right] \equiv \frac{a}{\bar{a}} \frac{(1+6\xi_h)h^2 + (1+6\xi_\chi)\chi^2}{M_P^2},$$

we obtain:

exp((2*0.40160966445*x)/(4.341e-9)) = 1.362747668642853

from which:

Input interpretation:

$$\exp\left(\frac{2\times 0.40160966445\,x}{4.341\times 10^{-9}}\right) = 1.362747668642853$$

Result:

$$e^{1.85031\times 10^{8}\,x} = 1.362747668642853$$

Real solution:

$$x \approx 1.67271\times 10^{-9}$$

$\Phi = 1.67271 * 10^{-9}$

Note that:

From:

https://www.damtp.cam.ac.uk/user/tong/string/seven.pdf

7. Low Energy Effective Actions

The gravitational part of the action takes the standard Einstein-Hilbert form. The gravitational coupling is given by

$$\kappa^2 = \kappa_0^2 e^{2\Phi_0} \sim l_s^{24} g_s^2 \tag{7.20}$$

The coefficient in front of Einstein-Hilbert term is usually identified with Newton's constant

$$8\pi G_N = \kappa^2$$

Note, however, that this is Newton's constant in $D = 26$ dimensions: it will differ from Newton's constant measured in a four-dimensional world. From Newton's constant, we define the $D = 26$ Planck length $8\pi G_N = l_p^{24}$ and Planck mass $M_p = l_p^{-1}$. (With the factor of 8π sitting there, this is usually called the reduced Planck mass). Comparing to (7.20), we see that weak string coupling, $g_s \ll 1$, provides a parameteric separation between the Planck scale and the string scale,

$$g_s \ll 1 \quad \Rightarrow \quad l_p \ll l_s$$

Often the mysteries of gravitational physics are associated with the length scale l_p. We understand string theory best when $g_s \ll 1$ where much of stringy physics occurs at $l_s \gg l_p$ and can be disentangled from strong coupling effects in gravity.

From

$$8\pi G_N = \kappa^2$$

we obtain:

$6.67408*10^{-11}$ * 8Pi = $1.6773792557976...*10^{-9}$ result very near to the above solution $1.67271 * 10^{-9}$

We have also:

(1.67271 * 10^-9 / 1.0151802656)^1/4096

Input interpretation:

$$\sqrt[4096]{1.67271 \times \frac{1}{10^9 \times 1.0151802656}}$$

Result:

0.9950746969...

0.9950746969... result very near to the value of the following Rogers-Ramanujan continued fraction:

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

From which:

2*sqrt(((log base 0.9950746969 (1.67271 * 10^-9 / 1.0151802656))))-Pi+1/golden ratio

Input interpretation:

$$2\sqrt{\log_{0.9950746969}\left(1.67271\times\frac{1}{10^9\times 1.0151802656}\right)}-\pi+\frac{1}{\phi}$$

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

ϕ is the golden ratio

Result:

125.4764...

125.4764... result very near to the Higgs boson mass 125.18 GeV

Alternative representation:

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}-\pi+\frac{1}{\phi}=-\pi+\frac{1}{\phi}+2\sqrt{\frac{\log\left(\frac{1.67271}{1.01518026560000\times 10^9}\right)}{\log(0.995075)}}$$

Series representations:

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}-\pi+\frac{1}{\phi}=\frac{1}{\phi}-\pi+2\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-1.)^k}{k}}{\log(0.995075)}}$$

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1+\log_{0.995075}(1.6477\times 10^{-9}))^{-k}$$

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}-\pi+\frac{1}{\phi}=$$
$$\frac{1}{\phi}-\pi+2\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}$$
$$\sum_{k=0}^{\infty}\frac{(-1)^k\,(-1+\log_{0.995075}(1.6477\times 10^{-9}))^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

2*sqrt(((log base 0.9950746969 (1.67271 * 10^-9 / 1.0151802656))))+11+1/golden ratio

Input interpretation:

$$2\sqrt{\log_{0.9950746969}\left(1.67271\times\frac{1}{10^9\times 1.0151802656}\right)}+11+\frac{1}{\phi}$$

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

ϕ is the golden ratio

Result:

139.6180...

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

Alternative representation:

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11+\frac{1}{\phi}=$$
$$11+\frac{1}{\phi}+2\sqrt{\frac{\log\left(\frac{1.67271}{1.01518026560000\times 10^9}\right)}{\log(0.995075)}}$$

Series representations:

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11+\frac{1}{\phi}=11+\frac{1}{\phi}+2\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-1.)^k}{k}}{\log(0.995075)}}$$

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11+\frac{1}{\phi}=11+\frac{1}{\phi}+$$
$$2\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\log_{0.995075}(1.6477\times 10^{-9})\right)^{-k}$$

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11+\frac{1}{\phi}=$$
$$11+\frac{1}{\phi}+2\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}$$
$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\log_{0.995075}(1.6477\times 10^{-9})\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

2*sqrt(((log base 0.9950746969 (1.67271 * 10^-9 / 1.0151802656))))+11-2+1/golden ratio

Input interpretation:

$$2\sqrt{\log_{0.9950746969}\left(1.67271\times\frac{1}{10^9\times 1.0151802656}\right)}+11-2+\frac{1}{\phi}$$

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

ϕ is the golden ratio

Result:

137.6180...

137.618… result practically equal to the golden angle value 137.5

Alternative representation:

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11-2+\frac{1}{\phi}=$$

$$9+\frac{1}{\phi}+2\sqrt{\frac{\log\left(\frac{1.67271}{1.01518026560000\times 10^9}\right)}{\log(0.995075)}}$$

Series representations:

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11-2+\frac{1}{\phi}=9+\frac{1}{\phi}+2\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-1.)^k}{k}}{\log(0.995075)}}$$

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11-2+\frac{1}{\phi}=$$

$$9+\frac{1}{\phi}+2\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\log_{0.995075}(1.6477\times 10^{-9})\right)^{-k}$$

$$2\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+11-2+\frac{1}{\phi}=$$

$$9+\frac{1}{\phi}+2\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\log_{0.995075}(1.6477\times 10^{-9})\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

27 sqrt(((log base 0.9950746969 (1.67271 * 10^-9 / 1.0151802656))))+1

Input interpretation:

$$27\sqrt{\log_{0.9950746969}\left(1.67271\times\frac{1}{10^9\times 1.0151802656}\right)}+1$$

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

Result:

1729.000...

1729

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

With regard 27 (From Wikipedia):

*"The fundamental group of the complex form, compact real form, or any algebraic version of E_6 is the cyclic group **Z**/3**Z**, and its outer automorphism group is the cyclic group **Z**/2**Z**. Its fundamental representation is 27-dimensional (complex), and a basis is given by the 27 lines on a cubic surface. The dual representation, which is inequivalent, is also 27-dimensional. In particle physics, E_6 plays a role in some grand unified theories".*

Alternative representation:

$$27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+1=1+27\sqrt{\frac{\log\left(\frac{1.67271}{1.01518026560000\times 10^9}\right)}{\log(0.995075)}}$$

Series representations:

$$27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+1=1+27\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-1.)^k}{k}}{\log(0.995075)}}$$

$$27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+1=$$
$$1+27\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\log_{0.995075}(1.6477\times 10^{-9})\right)^{-k}$$

$$27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)+1} =$$

$$1+27\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-1+\log_{0.995075}(1.6477\times 10^{-9})\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

(((27 sqrt(((log base 0.9950746969 (1.67271 * 10^-9 / 1.0151802656)))+1)))^1/15 - (21+5)1/10^3

Input interpretation:

$$\sqrt[15]{27\sqrt{\log_{0.9950746969}\left(1.67271\times\frac{1}{10^9\times 1.0151802656}\right)+1}}-(21+5)\times\frac{1}{10^3}$$

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

Result:

1.617815229022251679562762615348453239690097822571296507609...

1.61781522902… result that is a very good approximation to the value of the golden ratio 1,618033988749...

Alternative representation:

$$\sqrt[15]{27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)+1}}-\frac{21+5}{10^3} =$$

$$-\frac{26}{10^3}+\sqrt[15]{1+27\sqrt{\frac{\log\left(\frac{1.67271}{1.01518026560000\times 10^9}\right)}{\log(0.995075)}}}$$

Series representations:

$$\sqrt[15]{27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+1}-\frac{21+5}{10^3}=$$

$$-\frac{13}{500}+\sqrt[15]{1+27\sqrt{-\frac{\sum_{k=1}^{\infty}\frac{(-1)^k(-1.)^k}{k}}{\log(0.995075)}}}$$

$$\sqrt[15]{27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+1}-\frac{21+5}{10^3}=$$

$$-\frac{13}{500}+\left(1+27\sqrt{-1+\log_{0.995075}(1.6477\times 10^{-9})}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}(-1+\log_{0.995075}(1.6477\times 10^{-9}))^{-k}\right)^{\wedge}(1/15)$$

$$\sqrt[15]{27\sqrt{\log_{0.995075}\left(\frac{1.67271}{10^9\times 1.01518026560000}\right)}+1}-\frac{21+5}{10^3}=$$

$$-\frac{13}{500}+\sqrt[15]{1+27\sqrt{-\log(1.6477\times 10^{-9})\left(202.533+\sum_{k=0}^{\infty}(-0.0049253)^k G(k)\right)}}$$

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

With regard the value obtained 4.82e-7, from Wikipedia:

In string theory there is also a dilaton in the worldsheet CFT - two-dimensional conformal field theory. The exponential of its vacuum expectation value determines the coupling constant g and the Euler characteristic $\chi = 2 - 2g$ as $\int R = 2\pi\chi$ for compact worldsheets by the Gauss–Bonnet theorem, where the genus g counts the number of handles and thus the number of loops or string interactions described by a specific worldsheet.

$$g = \exp(\langle\phi\rangle)$$

Therefore, the dynamic variable coupling constant in string theory contrasts the quantum field theory where it is constant. As long as supersymmetry is unbroken, such scalar fields can take arbitrary values moduli). However, supersymmetry breaking usually creates a potential energy for the scalar fields and the scalar fields localize near a minimum whose position should in principle calculate in string theory.

we have that:

exp(4.82e-7)

Input interpretation:

$\exp(4.82 \times 10^{-7})$

Result:

1.000000482000116162018663363582268590797355336320678814464...

1.000000482... that is the coupling constant ***g***

Note that:

From:

http://hyperphysics.phy-astr.gsu.edu/hbase/Forces/couple.html

Strong Force Coupling Constant

In obtaining a coupling constant for the strong interaction, say in comparison to the electromagnetic force, it must be recognized that they are very different in nature. The electromagnetic force is infinite in range and obeys the inverse square law, while the strong force involves the exchange of massive particles and it therefore has a very short range. It is clear that the strong force is much stronger simply from the fact that the nuclear size (strong force dominant) is about 10^{-15} m while the atom (electromagnetic force dominant) is about 10^{-10} m in size. From consideration of the "particle in a box" problem and from just the uncertainty principle, we know it takes greater energy to confine a particle to a smaller volume.

The body of data describing the strong force between nucleons is consistent with a strong force coupling constant of about 1:

$$\alpha_s \approx 1$$

But the standard model sees the strong force as arising from the forces between the constituent quarks, which is called the color force. One of the discoveries about this force is that it dimishes inside the nucleons, so that the quarks are able to move freely within the hadrons. The implication for the strong force coupling constant is that it drops off at very small distances. This phenomenon is called "asymptotic freedom" because the quarks approach a state where they can move without resistance in the tiny volume of the hadron. Analysis of the coupling constant with quantum chromodynamics gives an expression for the diminishing coupling constant:

$$\alpha_s(E) = \frac{12\pi}{(33-2n_f)\ln\left[\frac{E^2}{\Lambda^2}\right]}$$

n_f = number of quarks active in pair production (up to 6)

Λ = experimentally determined parameter, $\approx 0.2 Gev$

We have obtained: 1.000000482... ≈ 1 = α_s = strong force coupling constant, value also very near to the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{2\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{(\varphi-1)^5\sqrt[4]{5^3}}-1}}-\varphi} = 1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\frac{e^{-6\pi\sqrt{5}}}{1+\frac{e^{-8\pi\sqrt{5}}}{1+\dots}}}} \approx 1.0000007913$$

Thus, the solution 1.0000007913 can be another possible value of α_s and perhaps can be the motivation of the results very near to the mass of Pion meson 139.57 that we always obtained from the various Ramanujan expressions.

From:

Higgs Inflation

Javier Rubio - Institut für Theoretische Physik, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany - REVIEW - published: 22 January 2019 - doi: 10.3389/fspas.2018.00050 - Frontiers in Astronomy and Space Sciences | www.frontiersin.org 1 January 2019 | Volume 5 | Article 50

We have that:

In the new frame, all the non-linearities associated with the non-minimal Higgs-gravity interaction are moved to the scalar sector of the theory,

$$S = \int d^4x\sqrt{-g}\left[\frac{M_P^2}{2}R - \frac{1}{2}M_P^2K(\Theta)(\partial\Theta)^2 - V(\Theta)\right], \quad (2.16)$$

The kinetic function

$$K(\Theta) \equiv \frac{1}{4|a|\Theta^2}\left(\frac{1-6|a|\Theta}{1-\Theta}\right), \qquad (2.18)$$

that is

$$\frac{1}{M_P^2}\left(\frac{d\phi}{d\Theta}\right)^2 = K(\Theta), \qquad (2.19)$$

to recast Equation (2.16) in terms of a canonically normalized scalar field ϕ. This differential equation admits an exact solution (Garcia-Bellido et al., 2009)

$$\frac{\sqrt{|a|}\phi}{M_P} = \operatorname{arcsinh}\sqrt{\frac{1-\Theta}{(1-6|a|)\Theta}} - \sqrt{6|a|}\operatorname{arcsinh}\sqrt{\frac{6|a|(1-\Theta)}{1-6|a|}}. \qquad (2.20)$$

From

$$\frac{\sqrt{|a|}\phi}{M_P} = \operatorname{arcsinh}\sqrt{\frac{1-\Theta}{(1-6|a|)\Theta}} - \sqrt{6|a|}\operatorname{arcsinh}\sqrt{\frac{6|a|(1-\Theta)}{1-6|a|}}.$$

for Θ = 1.0151802656; a = -0.1578947368421...., we obtain:

(sqrt(0.1578947368))x*1/(4.341e-9) = asinh (((((1-1.01518026)/(1-6*0.1578947368 * 1.01518026)))^1/2)) – (6*0.1578947368)^1/2 asinh (((((6*0.1578947368)(1-1.01518026)/(1-6*0.1578947368))))^1/2)

Input interpretation:

$$\sqrt{0.1578947368}\, x \times \frac{1}{4.341\times 10^{-9}} = \sinh^{-1}\left(\sqrt{\frac{1-1.01518026}{1+6\times 1.01518026\times(-0.1578947368)}}\right) - \sqrt{6\times 0.1578947368}\,\sinh^{-1}\left(\sqrt{(6\times 0.1578947368)\times\frac{1-1.01518026}{1+6\times(-0.1578947368)}}\right)$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

Result:

$9.15364\times 10^{7}\, x = 0.146142\, i$

Alternate form:

$9.15364\times10^7 x - 0.146142 i = 0$

Alternate form assuming x is real:

$9.15364\times10^7 x + 0 = 0.146142 i$

Complex solution:

$x = 1.59654\times10^{-9} i$

$\phi = 1.59654 * 10^{-9} i$

Indeed:

(sqrt(0.1578947368))(1.59654e-9*i)1/(4.341e-9)

Input interpretation:

$$\sqrt{0.1578947368}\,(1.59654\times10^{-9}\,i)\times\frac{1}{4.341\times10^{-9}}$$

i is the imaginary unit

Result:

$0.146142\ldots i$

Polar coordinates:

$r = 0.146142$ (radius), $\theta = 90°$ (angle)

0.146142 = K(Θ)

asinh (((((1-1.01518026)/(1-6*0.1578947368 * 1.01518026)))^1/2)) – (6*0.1578947368)^1/2 asinh (((((6*0.1578947368)(1-1.01518026)/(1-6*0.1578947368))))^1/2)

Input interpretation:

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518026}{1+6\times1.01518026\times(-0.1578947368)}}\right) - \sqrt{6\times0.1578947368}\,\sinh^{-1}\left(\sqrt{(6\times0.1578947368)\times\frac{1-1.01518026}{1+6\times(-0.1578947368)}}\right)$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

Result:

$0.146142\ldots i$

Polar coordinates:

$r = 0.146142$ (radius), $\theta = 90°$ (angle)

0.146142 = K(Θ)

Alternative representations:

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right) - \sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right) = \operatorname{sc}^{-1}\left(\sqrt{-\frac{0.0151803}{0.0382503}}\,\middle|\,1\right) - \operatorname{sc}^{-1}\left(\sqrt{-\frac{0.0143813}{0.0526316}}\,\middle|\,1\right)\sqrt{0.947368}$$

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right) - \sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right) = \operatorname{sd}^{-1}\left(\sqrt{-\frac{0.0151803}{0.0382503}}\,\middle|\,1\right) - \operatorname{sd}^{-1}\left(\sqrt{-\frac{0.0143813}{0.0526316}}\,\middle|\,1\right)\sqrt{0.947368}$$

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right) - \sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right) = -i\sin^{-1}\left(i\sqrt{-\frac{0.0151803}{0.0382503}}\right) + i\sin^{-1}\left(i\sqrt{-\frac{0.0143813}{0.0526316}}\right)\sqrt{0.947368}$$

Series representations:

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)=\sum_{k=0}^{\infty}\frac{(-1)^k\left((-0.254393\,i)\,e^{(-1.29739+3.14159\,i)k}+(0.314987\,i)\,e^{(-0.924155+3.14159\,i)k}\right)\left(\frac{1}{2}\right)_k}{(0.5+k)\,k!}$$

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)=\sum_{j=1}^{\infty}\frac{1}{\sqrt{\pi}}\left((-0.793684\,i)\left(\operatorname{Res}_{s=-j}\frac{(-0.396867)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)^2\Gamma(1+s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)+(0.931008\,i)\left(\operatorname{Res}_{s=-j}\frac{(-0.273245)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)^2\Gamma(1+s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)\right)$$

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)=-0.0133357\,i\,\pi-0.486664\,i\,\pi\exp\left(i\,\pi\left\lfloor\frac{\arg(i\,(-0.522728\,i+x))}{2\,\pi}\right\rfloor\right)+\frac{1}{2}\,i\,\pi\exp\left(i\,\pi\left\lfloor\frac{\arg(i\,(-0.629974\,i+x))}{2\,\pi}\right\rfloor\right)+\sum_{k=0}^{\infty}-\frac{1}{k!}\,0.486664\times 2^k\,x^{1-k}\left((0.522728\,i-x)^k\exp\left(i\,\pi\left\lfloor\frac{\arg(i\,(-0.522728\,i+x))}{2\,\pi}\right\rfloor\right)-1.0274\,(0.629974\,i-x)^k\exp\left(i\,\pi\left\lfloor\frac{\arg(i\,(-0.629974\,i+x))}{2\,\pi}\right\rfloor\right)\right)\,{}_3\tilde{F}_2\left(\frac{1}{2},\frac{1}{2},1;1-\frac{k}{2},\frac{3-k}{2};-x^2\right)\sqrt{\pi}\quad\text{for }(i\,x\in\mathbb{R}\text{ and }i\,x>1)$$

Integral representations:

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)=\int_0^1\left(\frac{0.629974\,i}{\sqrt{1-(0.396867+0\,i)\,t^2}}-\frac{0.508786\,i}{\sqrt{1-(0.273245+0\,i)\,t^2}}\right)dt$$

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)=\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}-\frac{(0.127197\,i)\left(e^{0.319165\,s}-1.23819\,e^{0.505617\,s}\right)\Gamma\left(\frac{1}{2}-s\right)^2\Gamma(s)\,\Gamma\left(\frac{1}{2}+s\right)}{i\,\pi\,\sqrt{\pi}}\,ds \text{ for } 0<\gamma<\frac{1}{2}$$

-64 * 4/ ((((asinh (((((1-1.01518026)/(1-6*0.1578947368 * 1.01518026)))^1/2)) – (6*0.1578947368)^1/2 asinh (((((6*0.1578947368)(1-1.01518026)/(1-6*0.1578947368))))^1/2)))))-(21+2)i+(1/3)i

Input interpretation:

$$-64\times 4\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518026}{1+6\times 1.01518026\times(-0.1578947368)}}\right)-\sqrt{6\times 0.1578947368}\,\sinh^{-1}\left(\sqrt{(6\times 0.1578947368)\times\frac{1-1.01518026}{1+6\times(-0.1578947368)}}\right)\right)-(21+2)\,i+\frac{1}{3}\,i$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

i is the imaginary unit

Result:

$1729.06\ldots i$

Polar coordinates:

$r = 1729.06$ (radius), $\theta = 90°$ (angle)

1729.06

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

Alternative representations:

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i(21+2)+\frac{i}{3}=-\frac{68i}{3}-\frac{256}{\left(\operatorname{sc}^{-1}\left(\sqrt{-\frac{0.0151803}{0.0382503}}\,\middle|\,1\right)-\operatorname{sc}^{-1}\left(\sqrt{-\frac{0.0143813}{0.0526316}}\,\middle|\,1\right)\right)\sqrt{0.947368}}$$

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i(21+2)+\frac{i}{3}=-\frac{68i}{3}-\frac{256}{\left(\operatorname{sd}^{-1}\left(\sqrt{-\frac{0.0151803}{0.0382503}}\,\middle|\,1\right)-\operatorname{sd}^{-1}\left(\sqrt{-\frac{0.0143813}{0.0526316}}\,\middle|\,1\right)\right)\sqrt{0.947368}}$$

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i\,(21+2)+\frac{i}{3}=-\frac{68\,i}{3}-\frac{256}{-i\sin^{-1}\left(i\sqrt{-\frac{0.0151803}{0.0382503}}\right)+i\sin^{-1}\left(i\sqrt{-\frac{0.0143813}{0.0526316}}\right)\sqrt{0.947368}}$$

$\text{sc}^{-1}(x\,|\,m)$ is the inverse of the Jacobi elliptic function sc

$\text{sd}^{-1}(x\,|\,m)$ is the inverse of the Jacobi elliptic function sd

$\sin^{-1}(x)$ is the inverse sine function

Series representations:

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i\,(21+2)+\frac{i}{3}=-\frac{68\,i}{3}-\frac{256}{\sum_{k=0}^{\infty}\frac{(-1)^k\left((-0.254393\,i)\,e^{(-1.29739+3.14159\,i)k}+(0.314987\,i)\,e^{(-0.924155+3.14159\,i)k}\right)\left(\frac{1}{2}\right)_k}{(0.5+k)\,k!}}$$

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i\,(21+2)+\frac{i}{3}=-\frac{68\,i}{3}-\left((322.546\,i)\sqrt{\pi}\right)\Big/\left(\sum_{j=1}^{\infty}\left(\text{Res}_{s=-j}\frac{(-0.396867)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)^2\,\Gamma(1+s)}{\Gamma\left(\frac{1}{2}-s\right)}-1.17302\left(\text{Res}_{s=-j}\frac{(-0.273245)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)^2\,\Gamma(1+s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)\right)\right)$$

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)\,(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-$$

$$i\,(21+2)+\frac{i}{3}=-\left(\left(22.6667\left(-23.2072+0.0274023\,i\,\pi\,\mathcal{A}+i\,\pi\,\mathcal{A}\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.522728\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)-1.0274\,i\,\pi\,\mathcal{A}\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.629974\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)+i\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.522728\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)\sqrt{\pi}\sum_{k=0}^{\infty}\frac{2^k\,(0.522728\,i-x)^k\,x^{1-k}\,{}_3\tilde{F}_2\left(\frac{1}{2},\frac{1}{2},1;1-\frac{k}{2},\frac{3-k}{2};-x^2\right)}{k!}-1.0274\,i\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.629974\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)\sqrt{\pi}\sum_{k=0}^{\infty}\frac{2^k\,(0.629974\,i-x)^k\,x^{1-k}\,{}_3\tilde{F}_2\left(\frac{1}{2},\frac{1}{2},1;1-\frac{k}{2},\frac{3-k}{2};-x^2\right)}{k!}\right)\right)\Big/\left(0.0274023\,\pi\,\mathcal{A}+\pi\,\mathcal{A}\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.522728\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)-1.0274\,\pi\,\mathcal{A}\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.629974\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)+\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.522728\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)\sqrt{\pi}\sum_{k=0}^{\infty}\frac{2^k\,(0.522728\,i-x)^k\,x^{1-k}\,{}_3\tilde{F}_2\left(\frac{1}{2},\frac{1}{2},1;1-\frac{k}{2},\frac{3-k}{2};-x^2\right)}{k!}-1.0274\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.629974\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)\sqrt{\pi}\sum_{k=0}^{\infty}\frac{2^k\,(0.629974\,i-x)^k\,x^{1-k}\,{}_3\tilde{F}_2\left(\frac{1}{2},\frac{1}{2},1;1-\frac{k}{2},\frac{3-k}{2};-x^2\right)}{k!}\right)\right)$$

for ($i\,x\in\mathbb{R}$ and $i\,x>1$)

Integral representations:

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i(21+2)+\frac{i}{3}=-\frac{68\,i}{3}+\frac{406.366\,i}{\int_0^1\left(\frac{1}{\sqrt{1-(0.396867+0\,i)t^2}}-\frac{0.807631}{\sqrt{1-(0.273245+0\,i)t^2}}\right)dt}$$

$$-\left((64\times 4)\Big/\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(6\times 0.157895)(1-1.01518)}{1-6\times 0.157895}}\right)\right)\right)-i(21+2)+\frac{i}{3}=$$

$$-\frac{68\,i}{3}-\frac{(2012.63\,i)\,\pi\,\mathcal{A}\sqrt{\pi}}{\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma}\left(e^{0.319165\,s}-1.23819\,e^{0.505617\,s}\right)\Gamma\left(\frac{1}{2}-s\right)^2\Gamma(s)\,\Gamma\left(\frac{1}{2}+s\right)ds}\quad\text{for}\quad 0<\gamma<\frac{1}{2}$$

We note also that, from the principal expression

$$\sinh^{-1}\left(\sqrt{\frac{1-1.01518026}{1+6\times 1.01518026\times(-0.1578947368)}}\right)-\sqrt{6\times 0.1578947368}\ \sinh^{-1}\left(\sqrt{(6\times 0.1578947368)\times\frac{1-1.01518026}{1+6\times(-0.1578947368)}}\right)$$

we obtain:

11*(((asinh (((((1-1.01518026)/(1-6*0.1578947368 * 1.01518026)))^1/2)) – (6*0.1578947368)^1/2 asinh (((((6*0.1578947368)(1-1.01518026)/(1-6*0.1578947368))))^1/2))))+(11*1/10^3)i

Input interpretation:

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518026}{1+6\times 1.01518026\times(-0.1578947368)}}\right)-\sqrt{6\times 0.1578947368}\ \sinh^{-1}\left(\sqrt{(6\times 0.1578947368)\times\frac{1-1.01518026}{1+6\times(-0.1578947368)}}\right)\right)+\left(11\times\frac{1}{10^3}\right)i$$

$\sinh^{-1}(x)$ is the inverse hyperbolic sine function

i is the imaginary unit

Result:

1.61856... i

Polar coordinates:

$r = 1.61856$ (radius), $\theta = 90°$ (angle)

1.61856 result that is a very good approximation to the value of the golden ratio 1,618033988749...

Alternative representations:

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=$$

$$11\left(\text{sc}^{-1}\left(\sqrt{-\frac{0.0151803}{0.0382503}}\,\middle|\,1\right)-\text{sc}^{-1}\left(\sqrt{-\frac{0.0143813}{0.0526316}}\,\middle|\,1\right)\sqrt{0.947368}\right)+\frac{11\,i}{10^3}$$

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=$$
$$11\left(\operatorname{sd}^{-1}\left(\sqrt{-\frac{0.0151803}{0.0382503}}\,\middle|\,1\right)-\operatorname{sd}^{-1}\left(\sqrt{-\frac{0.0143813}{0.0526316}}\,\middle|\,1\right)\sqrt{0.947368}\right)+\frac{11\,i}{10^3}$$

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=$$
$$11\left(-i\sin^{-1}\left(i\sqrt{-\frac{0.0151803}{0.0382503}}\right)+i\sin^{-1}\left(i\sqrt{-\frac{0.0143813}{0.0526316}}\right)\sqrt{0.947368}\right)+\frac{11\,i}{10^3}$$

$\operatorname{sc}^{-1}(x\,|\,m)$ is the inverse of the Jacobi elliptic function sc

$\operatorname{sd}^{-1}(x\,|\,m)$ is the inverse of the Jacobi elliptic function sd

$\sin^{-1}(x)$ is the inverse sine function

Series representations:

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=0.011\,i+$$
$$\sum_{k=0}^{\infty}\frac{(-1)^k\left((-2.79832\,i)\,e^{(-1.29739+3.14159\,i)k}+(3.46485\,i)\,e^{(-0.924155+3.14159\,i)k}\right)\left(\frac{1}{2}\right)_k}{(0.5+k)\,k!}$$

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=$$

$$0.011\,i+\sum_{j=1}^{\infty}\frac{1}{\sqrt{\pi}}\left((-8.73053\,i)\left(\text{Res}_{s=-j}\ \frac{(-0.396867)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)^2\,\Gamma(1+s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)+(10.2411\,i)\left(\text{Res}_{s=-j}\ \frac{(-0.273245)^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)^2\,\Gamma(1+s)}{\Gamma\left(\frac{1}{2}-s\right)}\right)\right)$$

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=$$

$$\frac{11\,i}{1000}-0.146693\,\pi\,\mathcal{A}-5.35331\,\pi\,\mathcal{A}\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.522728\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)+\frac{11}{2}\,\pi\,\mathcal{A}\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.629974\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)+\sum_{k=0}^{\infty}-\frac{1}{k!}\,5.35331\times 2^k\,x^{1-k}\left((0.522728\,i-x)^k\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.522728\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)-1.0274\,(0.629974\,i-x)^k\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg((-0.629974\,i+x)\,\mathcal{A})}{2\,\pi}\right\rfloor\right)\right)\,{}_3\tilde{F}_2\left(\frac{1}{2},\frac{1}{2},1;1-\frac{k}{2},\frac{3-k}{2};-x^2\right)\sqrt{\pi}\quad\text{for }(i\,x\in\mathbb{R}\text{ and }i\,x>1)$$

Integral representations:

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\ \sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=$$

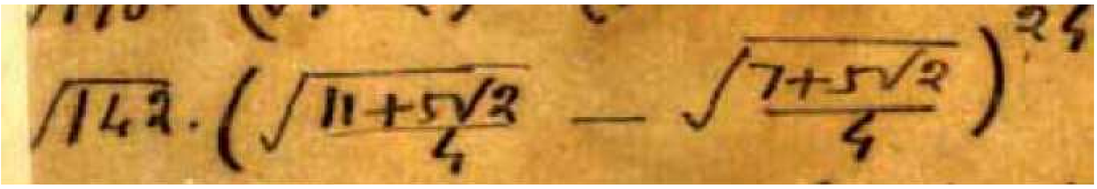
$$0.011\,i+\int_0^1\left(\frac{6.92971\,i}{\sqrt{1-(0.396867+0\,i)\,t^2}}-\frac{5.59665\,i}{\sqrt{1-(0.273245+0\,i)\,t^2}}\right)dt$$

$$11\left(\sinh^{-1}\left(\sqrt{\frac{1-1.01518}{1-6\times 0.157895\times 1.01518}}\right)-\sqrt{6\times 0.157895}\,\sinh^{-1}\left(\sqrt{\frac{(1-1.01518)\,6\times 0.157895}{1-6\times 0.157895}}\right)\right)+\frac{i\,11}{10^3}=0.011\,i+\int_{-\mathcal{A}\infty+\gamma}^{\mathcal{A}\infty+\gamma}-\frac{(1.39916\,i)\left(e^{0.319165\,s}-1.23819\,e^{0.505617\,s}\right)\Gamma\left(\frac{1}{2}-s\right)^2\Gamma(s)\,\Gamma\left(\frac{1}{2}+s\right)}{\pi\,\mathcal{A}\sqrt{\pi}}\,ds$$

for $0<\gamma<\frac{1}{2}$

From: **Manuscript Book II of Srinivasa Ramanujan**

Now, we have (pag. 302):



sqrt142 (((((sqrt(1/4*(11+5sqrt2)))) – ((sqrt(1/4*(7+5sqrt2)))))))^24

Input:

$$\sqrt{142}\left(\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)}-\sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}\right)^{24}$$

Result:

$$\sqrt{142}\left(\frac{1}{2}\sqrt{11+5\sqrt{2}}-\frac{1}{2}\sqrt{7+5\sqrt{2}}\right)^{24}$$

Decimal approximation:

$4.2063313414753316252174540855706339431072025172919219\ldots\times 10^{-14}$

$4.2063313414\ldots*10^{-14}$

Alternate forms:

$$\frac{\sqrt{142}\left(\sqrt{11+5\sqrt{2}}-\sqrt{7+5\sqrt{2}}\right)^{24}}{16\,777\,216}$$

$$\sqrt{\left(142\left(20064178973593989354119025601 + 14187517011168852729798806400\sqrt{2} - 2520\sqrt{\left(142\left(892859977067899354121985954835246279027023601409 + 631347344434776949083787862200150313637006916146\sqrt{2}\right)\right)}\right)\right)}$$

$$\frac{\sqrt{\frac{71}{2}}\left(\sqrt{7+5\sqrt{2}} - \sqrt{11+5\sqrt{2}}\right)^{24}}{8388608}$$

Minimal polynomial:

$$x^8 - 11396453657001385953139606541368\,x^6 + 3207593437472821049302768754348184\,x^4 - 229798091539775946359107026300144352\,x^2 + 406586896$$

From this expression, we obtain:

(3/Pi+(4Pi)/3^2) sqrt(((((sqrt142 (((((sqrt(1/4*(11+5sqrt2)))) – ((sqrt(1/4*(7+5sqrt2)))))))^24)))))

Input:

$$\left(\frac{3}{\pi} + \frac{4\pi}{3^2}\right)\sqrt{\sqrt{142}\left(\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)} - \sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}\right)^{24}}$$

Result:

$$\sqrt[4]{142}\left(\frac{1}{2}\sqrt{11+5\sqrt{2}} - \frac{1}{2}\sqrt{7+5\sqrt{2}}\right)^{12}\left(\frac{3}{\pi} + \frac{4\pi}{9}\right)$$

Decimal approximation:

$4.8221424004389575816382929731108629774940902903420276\ldots \times 10^{-7}$

$4.8221424004\ldots*10^{-7} = \phi_1$ result practically equal to the scalar charge obtained from the previous analyzed expression

$$\phi_1 - \frac{\alpha_0 Q_e^2}{M}\frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}}.$$

Property:

$\sqrt[4]{142}\left(-\frac{1}{2}\sqrt{7+5\sqrt{2}}+\frac{1}{2}\sqrt{11+5\sqrt{2}}\right)^{12}\left(\frac{3}{\pi}+\frac{4\pi}{9}\right)$ is a transcendental number

Alternate forms:

$$\frac{(27+4\pi^2)\sqrt[4]{142}\left(\sqrt{11+5\sqrt{2}}-\sqrt{7+5\sqrt{2}}\right)^{12}}{(9\pi)\,4096}$$

$$\frac{\sqrt[4]{71}\left(-9-5\sqrt{2}+\sqrt{127+90\sqrt{2}}\right)^{6}(27+4\pi^2)}{288\times 2^{3/4}\,\pi}$$

$$\Big(142\Big(20\,064\,178\,973\,593\,989\,354\,119\,025\,601+ 14\,187\,517\,011\,168\,852\,729\,798\,806\,400\sqrt{2}-2520\sqrt{\Big(142} \Big(892\,859\,977\,067\,899\,354\,121\,985\,954\,835\,246\,279\,027\,023\,601\,409+ 631\,347\,344\,434\,776\,949\,083\,787\,862\,200\,150\,313\,637\,006\,916\,146\sqrt{2}\Big)\Big)\Big)\Big)\wedge(1/4)\left(\frac{3}{\pi}+\frac{4\pi}{9}\right)$$

Series representations:

$$\left(\frac{3}{\pi}+\frac{4\pi}{3^2}\right)\sqrt{\sqrt{142}\left(\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)}-\sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}\right)^{24}} = \left(\frac{3}{\pi}+\frac{4\pi}{9}\right)\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\sqrt{142}\left(\sqrt{\frac{1}{4}(7+5\sqrt{2})}-\sqrt{\frac{1}{4}(11+5\sqrt{2})}\right)^{24}\right)^k}{k!}$$

$$\left(\frac{3}{\pi}+\frac{4\pi}{3^2}\right)\sqrt{\sqrt{142}\left(\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)}-\sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}\right)^{24}} = \left(\frac{3}{\pi}+\frac{4\pi}{9}\right)\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\sqrt{142}\left(\sqrt{\frac{1}{4}(7+5\sqrt{2})}-\sqrt{\frac{1}{4}(11+5\sqrt{2})}\right)^{24}-z_0\right)^k z_0^{-k}}{k!}$$

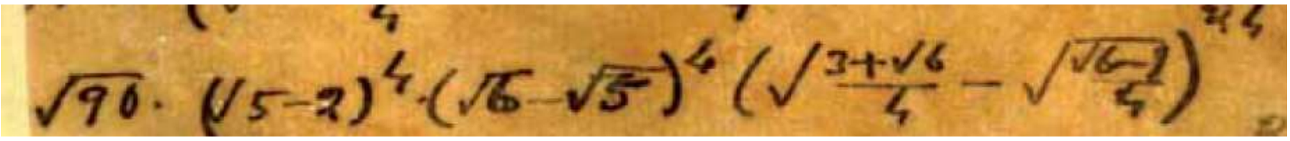
for not $((z_0\in\mathbb{R}$ and $-\infty<z_0\le 0))$

$$\left(\frac{3}{\pi}+\frac{4\pi}{3^2}\right)\sqrt{\sqrt{142}\left(\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)}-\sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}\right)^{24}} =$$

$$\left(\frac{3}{\pi}+\frac{4\pi}{9}\right)\exp\left(i\pi\left\lfloor\frac{\arg\left(-x+\sqrt{142}\left(-\sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}+\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)}\right)^{24}\right)}{2\pi}\right\rfloor\right)\sqrt{x}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k x^{-k}\left(-\frac{1}{2}\right)_k\left(-x+\sqrt{142}\left(-\sqrt{\frac{1}{4}\left(7+5\sqrt{2}\right)}+\sqrt{\frac{1}{4}\left(11+5\sqrt{2}\right)}\right)^{24}\right)^k}{k!}$$

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



sqrt90 (sqrt5-2)^4 (sqrt6 – sqrt5)^4 ((((((((3+sqrt6)/4)^1/2 – (((sqrt6-3)/4)^1/2)))))))^24

Input:

$$\sqrt{90}\left(\sqrt{5}-2\right)^4\left(\sqrt{6}-\sqrt{5}\right)^4\left(\sqrt{\frac{1}{4}\left(3+\sqrt{6}\right)}-\sqrt{\frac{1}{4}\left(\sqrt{6}-3\right)}\right)^{24}$$

Result:

$$3\sqrt{10}\left(\sqrt{5}-2\right)^4\left(\sqrt{6}-\sqrt{5}\right)^4\left(\frac{\sqrt{3+\sqrt{6}}}{2}-\frac{1}{2}i\sqrt{3-\sqrt{6}}\right)^{24}$$

Decimal approximation:

0.0035792157773050722986492370388161013825446770525544 7778... –
0.0070772544913839290607082392887943980166653476156247 4954... i

Polar coordinates:

$r \approx 0.00793086$ (radius), $\theta \approx -63.1727°$ (angle)

0.00793086

Alternate forms:

$$\frac{3\,(161-72\sqrt{5})\,(241\sqrt{10}-440\sqrt{3})\left(\sqrt{3+\sqrt{6}}-i\sqrt{3-\sqrt{6}}\right)^{24}}{16\,777\,216}$$

$$\frac{2187\,(329-460\,i\sqrt{2})\,(\sqrt{5}-2)^4\,(241\sqrt{10}-440\sqrt{3})}{4096}$$

$$\frac{3\sqrt{\frac{5}{2}}\,(\sqrt{5}-2)^4\left(\sqrt{5}-\sqrt{6}\right)^4\left(\sqrt{3-\sqrt{6}}+i\sqrt{3+\sqrt{6}}\right)^{24}}{8\,388\,608}$$

Minimal polynomial:

$$24\,519\,928\,653\,854\,221\,733\,733\,552\,434\,404\,946\,937\,899\,825\,954\,937\,634\,816\,x^{16} +$$
$$1\,060\,656\,101\,637\,832\,801\,984\,198\,970\,284\,306\,312\,754\,942\,177\,125\,188\,229\,756\,659\,628\,171\,591\,680\,x^{14} +$$
$$32\,656\,682\,455\,726\,454\,406\,950\,876\,492\,646\,317\,747\,039\,052\,055\,458\,633\,368\,028\,193\,413\,687\,104\,337\,128\,050\,183\,372\,800\,x^{12} +$$
$$157\,580\,267\,409\,687\,788\,967\,359\,335\,253\,430\,866\,427\,800\,896\,030\,514\,959\,235\,739\,469\,105\,477\,152\,609\,837\,528\,987\,400\,667\,136\,000\,x^{10} +$$
$$496\,613\,325\,790\,330\,500\,847\,625\,214\,559\,494\,346\,223\,567\,590\,101\,458\,296\,293\,276\,407\,810\,092\,277\,731\,357\,244\,463\,014\,380\,516\,147\,200\,000\,x^{8} +$$
$$361\,715\,639\,435\,626\,441\,234\,403\,944\,060\,764\,326\,145\,099\,321\,438\,505\,394\,184\,560\,172\,350\,216\,114\,436\,173\,227\,004\,576\,086\,253\,287\,086\,489\,600\,000\,x^{6} +$$
$$172\,069\,132\,985\,775\,022\,639\,512\,945\,572\,131\,901\,746\,366\,022\,458\,955\,280\,064\,419\,609\,316\,452\,856\,275\,550\,319\,182\,104\,210\,187\,971\,293\,230\,399\,488\,000\,000\,x^{4} +$$
$$12\,828\,354\,575\,885\,679\,150\,587\,851\,857\,234\,063\,398\,732\,212\,058\,174\,722\,247\,957\,419\,419\,142\,791\,760\,636\,500\,075\,281\,636\,884\,614\,170\,542\,080\,000\,000\,x^{2} +$$
$$680\,739\,601\,958\,833\,735\,012\,400\,099\,170\,605\,520\,166\,640\,891\,741\,766\,128\,159\,838\,407\,800\,853\,840\,938\,845\,165\,088\,342\,972\,823\,316\,625\,390\,625$$

1/((((sqrt90 (sqrt5-2)^4 (sqrt6 – sqrt5)^4 ((((((((3+sqrt6)/4)^1/2 – (((sqrt6-3)/4)^1/2)))))))^24))))-1

Input:

$$\frac{1}{\sqrt{90}\,(\sqrt{5}-2)^4\left(\sqrt{6}-\sqrt{5}\right)^4\left(\sqrt{\frac{1}{4}\left(3+\sqrt{6}\right)}-\sqrt{\frac{1}{4}\left(\sqrt{6}-3\right)}\right)^{24}}-1$$

Exact result:

$$-1+\frac{1}{3\sqrt{10}\,(\sqrt{5}-2)^4\left(\sqrt{6}-\sqrt{5}\right)^4\left(\frac{\sqrt{3+\sqrt{6}}}{2}-\frac{1}{2}\,i\sqrt{3-\sqrt{6}}\right)^{24}}$$

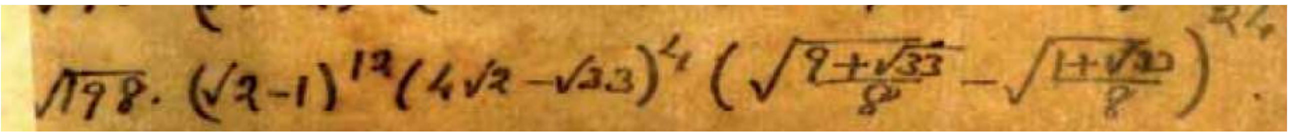
Decimal approximation:

55.904794343664590976003051033231515164109196378330760247 6... +
112.518980806798283178319540698932722762975205746002272178... i

Polar coordinates:

$r \approx 125.642$ (radius), $\theta \approx 63.5796°$ (angle)

125.642 result very near to the Higgs boson mass 125.18 GeV



sqrt198 (sqrt2-1)^12 (4sqrt2-sqrt33)^4 ((((sqrt((9+sqrt33)/8))-(sqrt((1+sqrt33)/8)))))^24

Input:

$$\sqrt{198}\left(\sqrt{2}-1\right)^{12}\left(4\sqrt{2}-\sqrt{33}\right)^4\left(\sqrt{\frac{1}{8}\left(9+\sqrt{33}\right)}-\sqrt{\frac{1}{8}\left(1+\sqrt{33}\right)}\right)^{24}$$

Result:

$$3\sqrt{22}\left(\sqrt{2}-1\right)^{12}\left(4\sqrt{2}-\sqrt{33}\right)^4\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{33}\right)}-\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{33}\right)}\right)^{24}$$

Decimal approximation:

$5.7021089610495144448980153678853736270841816487651930... \times 10^{-17}$

$5.702108961...*10^{-17}$

Alternate forms:

$$\frac{3\left(19601-13860\sqrt{2}\right)\left(8449\sqrt{22}-22880\sqrt{3}\right)\left(\sqrt{2\left(9+\sqrt{33}\right)}-\sqrt{2\left(1+\sqrt{33}\right)}\right)^{24}}{281474976710656}$$

$$\frac{3\sqrt{\frac{11}{2}}\left(\sqrt{2}-1\right)^{12}\left(4\sqrt{2}-\sqrt{33}\right)^{4}\left(\sqrt{1+\sqrt{33}}-\sqrt{9+\sqrt{33}}\right)^{24}}{34359738368}$$

$$\sqrt{\text{root of } x^8 - 12057557915772134092386196727564622384 x^7 + 2533592302767616739823926559444298928112 x^6 - 10296208352103720215855121114781503307781952 x^5 + 9050372678682251025552579128979586235405505120 x^4 - 403652552235874247342384168183894055678283646208 x^3 + 3894013851208455355974515128856354188146662452992 x^2 - 726524891388950974692631170026093950526110002686976 x + 2362226417735475456 \text{ near } x = 3.2514\times 10^{-33}}$$

Minimal polynomial:

$$x^{16} - 12057557915772134092386196727564622384 x^{14} + 2533592302767616739823926559444298928112 x^{12} - 10296208352103720215855121114781503307781952 x^{10} + 9050372678682251025552579128979586235405505120 x^8 - 403652552235874247342384168183894055678283646208 x^6 + 3894013851208455355974515128856354188146662452992 x^4 - 726524891388950974692631170026093950526110002686976 x^2 + 2362226417735475456$$

From which:

sqrt((((((sqrt198 (sqrt2-1)^12 (4sqrt2-sqrt33)^4 ((((sqrt((9+sqrt33)/8))-(sqrt((1+sqrt33)/8)))))^24))))))*64

Input:

$$\sqrt{\sqrt{198}\left(\sqrt{2}-1\right)^{12}\left(4\sqrt{2}-\sqrt{33}\right)^{4}\left(\sqrt{\frac{1}{8}\left(9+\sqrt{33}\right)}-\sqrt{\frac{1}{8}\left(1+\sqrt{33}\right)}\right)^{24}}\times 64$$

Result:

$$64\sqrt{3}\sqrt[4]{22}\left(\sqrt{2}-1\right)^{6}\left(\sqrt{33}-4\sqrt{2}\right)^{2}\left(\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{33}\right)}-\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{33}\right)}\right)^{12}$$

Decimal approximation:

$4.8327878397937986831074868748811331802480555783625723... \times 10^{-7}$

$4.8327878397...*10^{-7} = \phi_1$ result practically equal to the scalar charge obtained from the previous analyzed expression

$$\phi_1 = \frac{\alpha_0 Q_e^2}{M} \frac{1}{1+\sqrt{1+(\alpha_0^2-1)Q_e^2/M^2}} .$$

Alternate forms:

$$\frac{1}{262\,144}\left(\sqrt{2\left(9+\sqrt{33}\right)}-\sqrt{2\left(1+\sqrt{33}\right)}\right)^{12}$$

$$\sqrt{3\left(19\,601-13\,860\sqrt{2}\right)\left(8449\sqrt{22}-22\,880\sqrt{3}\right)}$$

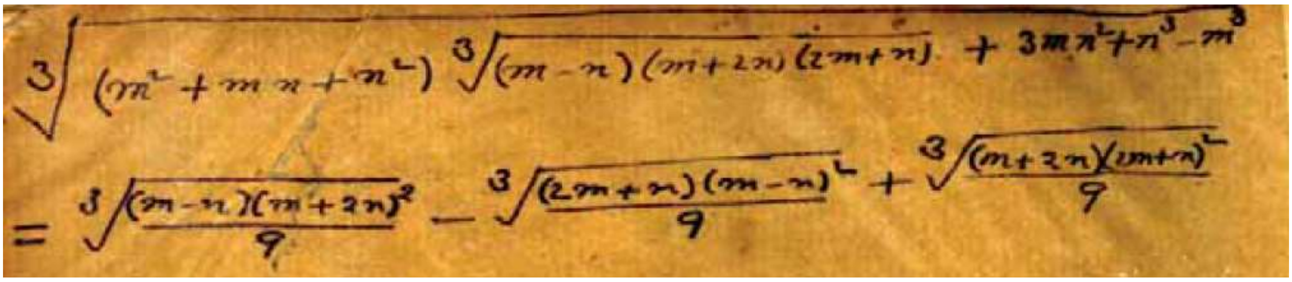
$$\frac{\sqrt{3}\,\sqrt[4]{11}\,(\sqrt{2}-1)^6\left(65-8\sqrt{66}\right)\left(\sqrt{2(1+\sqrt{33})}-\sqrt{2(9+\sqrt{33})}\right)^{12}}{131\,072\times 2^{3/4}}$$

root of $x^8 - 202\,292\,253\,585\,418\,900\,448\,927\,177\,916\,844\,823\,694\,802\,944\,x^7 + 713\,142\,834\,415\,812\,226\,934\,761\,414\,401\,658\,967\,155\,598\,624\,368\,361\,472\,x^6 - 48\,622\,469\,222\,617\,110\,847\,483\,808\,698\,768\,568\,023\,481\,742\,077\,777\,030\,506\,812\,014\,592\,x^5 + 717\,044\,397\,401\,295\,241\,354\,381\,687\,790\,050\,005\,991\,666\,990\,712\,097\,127\,552\,259\,775\,766\,273\,720\,320\,x^4 - 536\,546\,273\,001\,957\,188\,255\,122\,197\,540\,875\,172\,478\,836\,261\,456\,036\,394\,859\,384\,130\,569\,381\,449\,683\,915\,767\,808\,x^3 + 86\,839\,410\,695\,348\,701\,139\,657\,880\,471\,005\,349\,726\,694\,575\,403\,551\,251\,470\,656\,957\,734\,568\,810\,046\,298\,883\,088\,472\,604\,672\,x^2 - 271\,825\,233\,491\,611\,714\,543\,166\,740\,040\,159\,134\,122\,208\,374\,524\,160\,744\,613\,343\,102\,333\,675\,775\,857\,571\,468\,392\,479\,324\,312\,443\,027\,456\,x + 14\,827\,935\,546\,143\,615\,271\,470\,550\,396\,658\,898\,020\,194\,333\,646\,915\,484\,345\,953\,926\,832\,603\,923\,480\,576$ near $x = 5.45495 \times 10^{-26}$ ^ (1/4)

Minimal polynomial:

$x^{32} - 202\,292\,253\,585\,418\,900\,448\,927\,177\,916\,844\,823\,694\,802\,944\,x^{28} +$
$713\,142\,834\,415\,812\,226\,934\,761\,414\,401\,658\,967\,155\,598\,624\,368\,361\,472\,x^{24} -$
$48\,622\,469\,222\,617\,110\,847\,483\,808\,698\,768\,568\,023\,481\,742\,077\,777\,030\,506\,812\cdot.$
$014\,592\,x^{20} +$
$717\,044\,397\,401\,295\,241\,354\,381\,687\,790\,050\,005\,991\,666\,990\,712\,097\,127\,552\,259\cdot.$
$775\,766\,273\,720\,320\,x^{16} -$
$536\,546\,273\,001\,957\,188\,255\,122\,197\,540\,875\,172\,478\,836\,261\,456\,036\,394\,859\,384\cdot.$
$130\,569\,381\,449\,683\,915\,767\,808\,x^{12} +$
$86\,839\,410\,695\,348\,701\,139\,657\,880\,471\,005\,349\,726\,694\,575\,403\,551\,251\,470\,656\cdot.$
$957\,734\,568\,810\,046\,298\,883\,088\,472\,604\,672\,x^{8} -$
$271\,825\,233\,491\,611\,714\,543\,166\,740\,040\,159\,134\,122\,208\,374\,524\,160\,744\,613\,343\cdot.$
$102\,333\,675\,775\,857\,571\,468\,392\,479\,324\,312\,443\,027\,456\,x^{4} +$
$14\,827\,935\,546\,143\,615\,271\,470\,550\,396\,658\,898\,020\,194\,333\,646\,915\,484\,345\,953\cdot.$
$926\,832\,603\,923\,480\,576$

Now, we have that (page 318):



For m = 5, n = 3, we obtain:

(((((5-3)(5+2*3)^2)/9)^1/3)) – (((((2*5+3)(5-3)^2)/9)^1/3)) +
(((((5+2*3)(2*5+3)^2)/9)^1/3))

Input:

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

Result:

$$\frac{\sqrt[3]{2}\ 11^{2/3}}{3^{2/3}} - \left(\frac{2}{3}\right)^{2/3}\sqrt[3]{13} + \frac{\sqrt[3]{11}\ 13^{2/3}}{3^{2/3}}$$

Decimal approximation:

7.112719917559886252728237482895165037802526786770790308858...

7.1127199175598862…..

Alternate forms:

$$\frac{1}{3}\left(\sqrt[3]{6}\ 11^{2/3} - 2^{2/3}\ \sqrt[3]{39} + 13^{2/3}\ \sqrt[3]{33}\right)$$

$$\sqrt[3]{37 + 49\sqrt[3]{286}}$$

$$-\frac{-\sqrt[3]{2}\ 11^{2/3} + 2^{2/3}\ \sqrt[3]{13} - \sqrt[3]{11}\ 13^{2/3}}{3^{2/3}}$$

Minimal polynomial:

$$x^9 - 111\,x^6 + 4107\,x^3 - 33\,698\,267$$

From which:

1/((((((((5-3)(5+2*3)^2)/9)^1/3)) – (((((2*5+3)(5-3)^2)/9)^1/3)) + (((((5+2*3)(2*5+3)^2)/9)^1/3)))))+4*1/10^3-1+1.0018674362

where 1.0018674362 is the result of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{2\pi}{5}}}{\sqrt{\varphi\sqrt{5}-\varphi}} = 1+\frac{e^{-2\pi}}{1+\frac{e^{-4\pi}}{1+\frac{e^{-6\pi}}{1+\frac{e^{-8\pi}}{1+\ldots}}}} \approx 1.0018674362$$

Input interpretation:

$$\frac{1}{\sqrt[3]{\frac{1}{9}\left((5-3)(5+2\times 3)^2\right)} - \sqrt[3]{\frac{1}{9}\left((2\times 5+3)(5-3)^2\right)} + \sqrt[3]{\frac{1}{9}\left((5+2\times 3)(2\times 5+3)^2\right)}} + 4\times\frac{1}{10^3} - 1 + 1.0018674362$$

Result:

0.1464606286…

0.1464606286... = K(Θ)

We have also:

11 * (((1/((((((((5-3)(5+2*3)^2)/9)^1/3)) – (((((2*5+3)(5-3)^2)/9)^1/3)) + (((((5+2*3)(2*5+3)^2)/9)^1/3))))))+4*1/10^3-1+1.0018674362)))+7/10^3

Input interpretation:

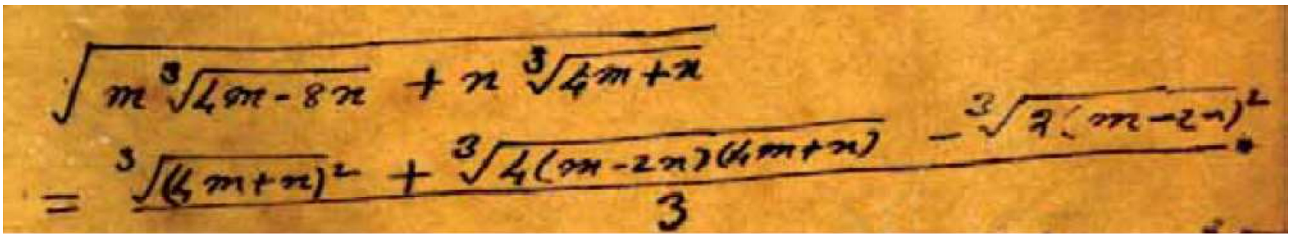
$$11\left(\frac{1}{\sqrt[3]{\frac{1}{9}\left((5-3)(5+2\times3)^2\right)}-\sqrt[3]{\frac{1}{9}\left((2\times5+3)(5-3)^2\right)}+\sqrt[3]{\frac{1}{9}\left((5+2\times3)(2\times5+3)^2\right)}}+4\times\frac{1}{10^3}-1+1.0018674362\right)+\frac{7}{10^3}$$

Result:

1.618066915...

1.618066915... result that is a very good approximation to the value of the golden ratio 1,618033988749...

Now, we have that (page 319):



$$\sqrt{m\sqrt[3]{4m-8n}+n\sqrt[3]{4m+n}} = \frac{\sqrt[3]{(4m+n)^2}+\sqrt[3]{4(m-2n)(4m+n)}-\sqrt[3]{2(m-2n)^2}}{3}$$

For m = 5, n = 3, we obtain:

sqrt((5*(4*5-8*3)^1/3 + 3*(4*5+3)^1/3))

Input:

$$\sqrt{5\sqrt[3]{4\times5-8\times3}+3\sqrt[3]{4\times5+3}}$$

Result:

$$\sqrt{5\sqrt[3]{-1}\;2^{2/3}+3\sqrt[3]{23}}$$

Decimal approximation:

3.658239547258167199593380893445923847589264984230856500 1... +
0.9394748616373111915957903713572914779775109037036805 5876... i

Polar coordinates:

$r \approx 3.77695$ (radius), $\theta \approx 14.4029°$ (angle)

3.77695

Alternate forms:

$$\sqrt{5\sqrt[3]{-4} + 3\sqrt[3]{23}}$$

$$\sqrt{3\sqrt[3]{23} + \text{root of } x^3 + 500 \text{ near } x = 3.9685 + 6.87365\,i}$$

$$\text{root of } x^9 - 79x^6 + 2939x^3 - 1331 \text{ near } x = 3.65824 + 0.939475\,i$$

Minimal polynomial:

$$x^9 - 79x^6 + 2939x^3 - 1331$$

All 2nd roots of 5 (-1)^(1/3) 2^(2/3) + 3 23^(1/3):

$$\sqrt[4]{\frac{75}{2^{2/3}} + \left(\frac{5}{\sqrt[3]{2}} + 3\sqrt[3]{23}\right)^2}\; e^{\frac{1}{2} i \tan^{-1}\left(\frac{5\sqrt{3}}{\sqrt[3]{2}\left(\frac{5}{\sqrt[3]{2}} + 3\sqrt[3]{23}\right)}\right)} \approx 3.6582 + 0.9395\,i \text{ (principal root)}$$

$$\sqrt[4]{\frac{75}{2^{2/3}} + \left(\frac{5}{\sqrt[3]{2}} + 3\sqrt[3]{23}\right)^2}\; \exp\left(i\left(-2\pi + \frac{1}{2}\left(2\pi + \tan^{-1}\left(\frac{5\sqrt{3}}{\sqrt[3]{2}\left(\frac{5}{\sqrt[3]{2}} + 3\sqrt[3]{23}\right)}\right)\right)\right)\right)$$

$$\approx -3.6582 - 0.9395\,i$$

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

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

Input:

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

Result:

$$\frac{1}{3}\left(-\sqrt[3]{2} + \sqrt[3]{-23}\; 2^{2/3} + 23^{2/3}\right)$$

Decimal approximation:

3.02827902231073061720977558980680967230413925188010251009... +
1.30318274029455165944914790942056110508613534995044753900... i

Polar coordinates:

$r \approx 3.29678$ (radius), $\theta \approx 23.284°$ (angle)

3.29678

Alternate forms:

$$\frac{1}{3}\left(23^{2/3} + \sqrt[3]{-92} - \sqrt[3]{2}\right)$$

$$\frac{1}{3}\left(\boxed{\text{root of } x^3 + 92 \text{ near } x = 2.25718 + 3.90955\, i} - \sqrt[3]{2} + 23^{2/3}\right)$$

$$-\frac{\sqrt[3]{2}}{3} + \frac{1}{3}\sqrt[3]{-23}\ 2^{2/3} + \frac{23^{2/3}}{3}$$

Minimal polynomial:

$$19683\, x^{18} - 1299078\, x^{15} + 131799555\, x^{12} - 3549466008\, x^9 + 120930363369\, x^6 - 495579761622\, x^3 + 981218819953$$

From which:

(13/(3Pi^4))*(((1/3* (((((4*5+3)^2)^1/3+(4*(5-2*3)(4*5+3))^1/3 – (2(5-2*3)^2)^1/3))))))

Input:

$$\frac{13}{3\pi^4}\left(\frac{1}{3}\left(\sqrt[3]{(4\times5+3)^2} + \sqrt[3]{4(5-2\times3)(4\times5+3)} - \sqrt[3]{2(5-2\times3)^2}\right)\right)$$

Result:

$$\frac{13\left(-\sqrt[3]{2} + \sqrt[3]{-23}\ 2^{2/3} + 23^{2/3}\right)}{9\pi^4}$$

Decimal approximation:

0.1347157877228574167795585846724146284669184925330102184... +
0.05797328717472401146210904594841020463270130119917869412... i

Property:

$\frac{13\left(-\sqrt[3]{2} + \sqrt[3]{-23}\ 2^{2/3} + 23^{2/3}\right)}{9\pi^4}$ is a transcendental number

Polar coordinates:

$r \approx 0.14666$ (radius), $\theta \approx 23.284°$ (angle)

0.14666 = K(Θ)

Alternate forms:

$$\frac{13\left(23^{2/3}+\sqrt[3]{-92}-\sqrt[3]{2}\right)}{9\pi^4}$$

$$\frac{13\left(\boxed{\text{root of } x^3+92 \text{ near } x=2.25718+3.90955\,i}-\sqrt[3]{2}+23^{2/3}\right)}{9\pi^4}$$

$$\frac{-\frac{13\sqrt[3]{2}}{9}+\frac{13}{9}\sqrt[3]{-23}\;2^{2/3}+\frac{13\times 23^{2/3}}{9}}{\pi^4}$$

Alternative representations:

$$\frac{\left(\sqrt[3]{(4\times5+3)^2}+\sqrt[3]{4(5-2\times3)(4\times5+3)}-\sqrt[3]{2(5-2\times3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(\sqrt[3]{-92}-\sqrt[3]{2}+\sqrt[3]{23^2}\right)}{3\left(3(180°)^4\right)}$$

$$\frac{\left(\sqrt[3]{(4\times5+3)^2}+\sqrt[3]{4(5-2\times3)(4\times5+3)}-\sqrt[3]{2(5-2\times3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(\sqrt[3]{-92}-\sqrt[3]{2}+\sqrt[3]{23^2}\right)}{3\left(3(-i\log(-1))^4\right)}$$

$$\frac{\left(\sqrt[3]{(4\times5+3)^2}+\sqrt[3]{4(5-2\times3)(4\times5+3)}-\sqrt[3]{2(5-2\times3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(\sqrt[3]{-92}-\sqrt[3]{2}+\sqrt[3]{23^2}\right)}{3\left(3\cos^{-1}(-1)^4\right)}$$

Series representations:

$$\frac{\left(\sqrt[3]{(4\times 5+3)^2}+\sqrt[3]{4(5-2\times 3)(4\times 5+3)}-\sqrt[3]{2(5-2\times 3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(-\sqrt[3]{2}+\sqrt[3]{-23}\,2^{2/3}+23^{2/3}\right)}{2304\left(\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}\right)^4}$$

$$\frac{\left(\sqrt[3]{(4\times 5+3)^2}+\sqrt[3]{4(5-2\times 3)(4\times 5+3)}-\sqrt[3]{2(5-2\times 3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(-\sqrt[3]{2}+\sqrt[3]{-23}\,2^{2/3}+23^{2/3}\right)}{9\left(\sum_{k=0}^{\infty}-\frac{4(-1)^k\,1195^{-1-2k}\left(5^{1+2k}-4\times 239^{1+2k}\right)}{1+2k}\right)^4}$$

$$\frac{\left(\sqrt[3]{(4\times 5+3)^2}+\sqrt[3]{4(5-2\times 3)(4\times 5+3)}-\sqrt[3]{2(5-2\times 3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(-\sqrt[3]{2}+\sqrt[3]{-23}\,2^{2/3}+23^{2/3}\right)}{9\left(\sum_{k=0}^{\infty}\left(-\frac{1}{4}\right)^k\left(\frac{1}{1+2k}+\frac{2}{1+4k}+\frac{1}{3+4k}\right)\right)^4}$$

Integral representations:

$$\frac{\left(\sqrt[3]{(4\times 5+3)^2}+\sqrt[3]{4(5-2\times 3)(4\times 5+3)}-\sqrt[3]{2(5-2\times 3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(-\sqrt[3]{2}+\sqrt[3]{-23}\,2^{2/3}+23^{2/3}\right)}{144\left(\int_0^{\infty}\frac{1}{1+t^2}\,dt\right)^4}$$

$$\frac{\left(\sqrt[3]{(4\times 5+3)^2}+\sqrt[3]{4(5-2\times 3)(4\times 5+3)}-\sqrt[3]{2(5-2\times 3)^2}\right)13}{3(3\pi^4)}=\frac{13\left(-\sqrt[3]{2}+\sqrt[3]{-23}\,2^{2/3}+23^{2/3}\right)}{2304\left(\int_0^{1}\sqrt{1-t^2}\,dt\right)^4}$$

$$\frac{\left(\sqrt[3]{(4\times5+3)^2}+\sqrt[3]{4(5-2\times3)(4\times5+3)}-\sqrt[3]{2(5-2\times3)^2}\right)13}{3(3\pi^4)}=$$

$$\frac{13\left(-\sqrt[3]{2}+\sqrt[3]{-23}\,2^{2/3}+23^{2/3}\right)}{144\left(\int_0^1\frac{1}{\sqrt{1-t^2}}\,dt\right)^4}$$

Observations

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

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

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

Then, in nearly oracular tone Ramanujan went on: "There appear to be corresponding properties," he wrote in his 1919 paper, "in which the moduli are powers of 5, 7 or 11...and no simple properties for any moduli involving primes other than these three." (Primes are whole numbers that are only divisible by themselves or by 1.) Thus, for instance, there should be formulas for an infinity of n's separated by 5^3 = 125 units, saying that the corresponding p(n)'s should all be divisible by 125.

In the past methods developed to understand partitions have later been applied to physics problems such as the theory of the strong nuclear force or the entropy of black holes.

From Wikipedia

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

Can be this the motivation that from the development of the Ramanujan's equations we obtain results very near to the dilaton mass calculated as a type of Higgs boson: 125 GeV for T = 0 and to the Higgs boson mass 125.18 GeV and practically equal to the rest mass of Pion meson 139.57 MeV

Note that:

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

Hence

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

so that

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

Hence

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

Thence:

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

And

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

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

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

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

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

The beginning of the sequence is thus:

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

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

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

The sequence of Lucas numbers is:

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

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

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

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

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

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

References

SUPERSTRING THEORY
Volume 2
Loop amplitudes, anomalies and phenomenology

MICHAEL B. GREEN
Queen Mary College, University of London

JOHN H. SCHWARZ
California Institute of Technology

EDWARD WITTEN
Princeton University

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

©Cambridge University Press 1987

First published 1987
Reprinted 1987

Printed in the United States of America

Black Hole Dynamics in Einstein-Maxwell-Dilaton Theory
Eric W. Hirschmann, Luis Lehner, Steven L. Liebling and Carlos Palenzuela
arXiv:1706.09875v1 [gr-qc] 29 Jun 2017

Higgs Inflation
Javier Rubio - Institut für Theoretische Physik, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany - REVIEW - published: 22 January 2019 - doi: 10.3389/fspas.2018.00050 - Frontiers in Astronomy and Space Sciences | www.frontiersin.org 1 January 2019 | Volume 5 | Article 50

STRING THEORY VOLUME II - Superstring Theory and Beyond
JOSEPH POLCHINSKI
Institute for Theoretical Physics - © Cambridge University Press 2001, 2005
University of California at Santa Barbara

Manuscript Book II of Srinivasa Ramanujan