Analyzing some Ramanujan formulas: mathematical connections with various equations concerning some sectors of Black Holes/Wormholes Physics and Brane Cosmology V

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Abstract

The purpose of this paper is to show how using certain mathematical values and / or constants from some Ramanujan expressions, we obtain some mathematical connections with equations of various sectors of Black Holes/Wormholes Physics and Brane Cosmology

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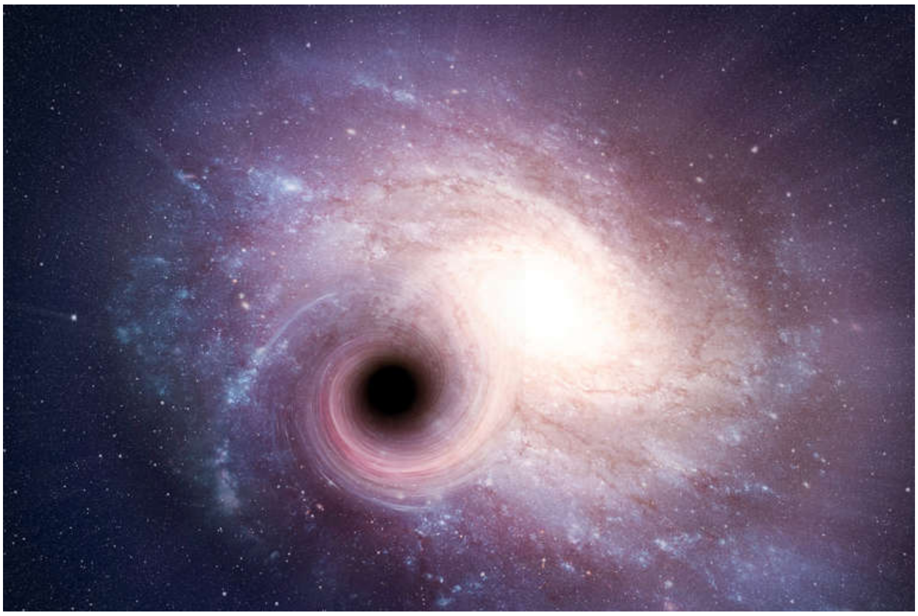
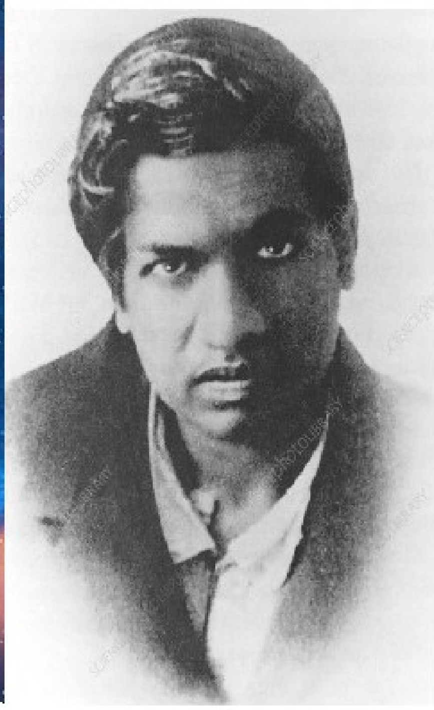


Monster black hole 100,000 times more massive than the sun is found in the heart of our galaxy (SMBH Sagittarius A = $1{,}9891*10^{35}$)
https://www.seeker.com/space/astronomy/new-class-of-black-hole-100000-times-larger-than-the-sun-detected-in-milky-way

(N.O.A – Pics. from the web)

From:

The Kerr-Newman metric: A Review
Tim Adamo and E. T. Newman - arXiv:1410.6626v2 [gr-qc] 14 Nov 2016

We have that:

$a \in \mathbb{R}$

$$\Psi_0 = \Psi_1 = \Psi_3 = \Psi_4 = 0, \qquad \Psi_2 = \frac{-M}{(r - ia\cos\theta)^3} + \frac{Q^2}{(r + ia\cos\theta)(r - ia\cos\theta)^3}. \quad (2.28)$$

for θ = π; M = 13.12806e+39, r = 1.94973e+13 and a = 5, we obtain:

-(13.12806e+39)/(1.94973e+13 – i*5 cosPi)^3 + x^2/(((1.94973e+13 + i*5 cosPi)(1.94973e+13 – i*5 cosPi)^3)) = y

Input interpretation:

$$-\frac{13.12806\times 10^{39}}{(1.94973\times 10^{13} - (i\times 5)\cos(\pi))^3} + \frac{x^2}{(1.94973\times 10^{13} + i\times 5\cos(\pi))(1.94973\times 10^{13} - (i\times 5)\cos(\pi))^3} = y$$

i is the imaginary unit

Result:

$$\left(6.91994\times 10^{-54} - 3.54918\times 10^{-66}\, i\right) x^2 - \left(1.77124 - 1.36268\times 10^{-12}\, i\right) = y$$

Alternate forms:

$$-\left(1.77124 - 1.36268\times 10^{-12}\, i\right) + \left(6.91994\times 10^{-54} - 3.54918\times 10^{-66}\, i\right) x^2 - y = 0$$

$$\left(\left(2.63058\times 10^{-27} - 6.746\times 10^{-40}\, i\right) x - \left(1.33088 - 5.11947\times 10^{-13}\, i\right)\right) \left(\left(1.33088 - 5.11947\times 10^{-13}\, i\right) + \left(2.63058\times 10^{-27} - 6.746\times 10^{-40}\, i\right) x\right) = y$$

Alternate form assuming x and y are real:

$$6.91994\times 10^{-54}\, x^2 + i\left(1.36268\times 10^{-12} - 3.54918\times 10^{-66}\, x^2\right) - 1.77124 = y$$

Real solutions:

$x \approx -6.19631 \times 10^{26}, \quad y \approx 0.885619$

$x \approx 6.19631 \times 10^{26}, \quad y \approx 0.885619$

Q = 6.19631e+26

Solution:

$$
\begin{aligned}
y \approx\ & (-6.27438 \times 10^{-122}\, i)\,(-\\
& (21\,718\,163\,307\,832\,410\,450\,712\,000\,769\,805\,272\,118\,811\,589\,348\,989\,396\ddots\\
& \quad 565\,299\,581\,814\,257\,781\,856\,182\,617\,321\,743\,975\,958\,896\,599\,347\,899\\
& \quad 662\,336 +\\
& \quad 28\,229\,703\,030\,786\,729\,338\,598\,473\,692\,628\,027\,982\,090\,457\,248\,680\ddots\\
& \quad 982\,458\,342\,072\,801\,273\,411\,720\,105\,882\,385\,848\,358\,950\,515\,771\ddots\\
& \quad 395\,800\,336\,482\,780\,212\,887\,552\, i) +\\
& (56\,566\,174\,421\,813\,898\,296\,798\,928\,228\,175\,747\,808\,983\,814\,500\,455\,022\,592\\
& \quad +\\
& \quad 110\,288\,767\,255\,443\,237\,216\,657\,642\,120\,659\,015\,274\,977\,402\,442\,418\ddots\\
& \quad 439\,115\,186\,796\,232\,704\, i)\, x^2)
\end{aligned}
$$

Partial derivatives:

$$\frac{\partial}{\partial x}\left(\left(6.91994 \times 10^{-54} - 3.54918 \times 10^{-66}\, i\right) x^2 - \left(1.77124 - 1.36268 \times 10^{-12}\, i\right)\right) =$$
$$\left(1.38399 \times 10^{-53} - 7.09835 \times 10^{-66}\, i\right) x$$

$$\frac{\partial}{\partial y}\left(\left(6.91994 \times 10^{-54} - 3.54918 \times 10^{-66}\, i\right) x^2 - \left(1.77124 - 1.36268 \times 10^{-12}\, i\right)\right) = 0$$

Implicit derivatives:

$$
\begin{aligned}
\frac{\partial x(y)}{\partial y} = \ & \frac{1}{x}\\
& (16\,856\,724\,812\,760\,812\,385\,676\,244\,719\,116\,342\,276\,641\,767\,232\,216\,879\,641\,901\ddots\\
& \quad 290\,526\,083\,286\,740\,726\,406\,573\,284\,576\,996\,880\,545\,414\,008\,510\,703\,699\,735\ddots\\
& \quad 288\,566\,451\,225\,181\,066\,269\,045\,030\,912/\\
& \quad 233\,294\,927\,548\,197\,254\,632\,110\,978\,953\,550\,569\,112\,626\,598\,445\,807\,031\ddots\\
& \quad 437\,279\,472\,870\,817\,288\,862\,199\,784\,409\,091\,111\,537 +\\
& \quad (8\,645\,671\,355\,911\,233\,312\,087\,364\,779\,576\,631\,038\,997\,022\,496\,185\,660\,301\ddots\\
& \quad 123\,208\,160\,799\,787\,956\,154\,814\,179\,647\,984\,428\,890\,570\,589\,796\,864\ddots\\
& \quad 498\,398\,053\,896\,852\,234\,569\,777\,152\, i)/\\
& \quad 233\,294\,927\,548\,197\,254\,632\,110\,978\,953\,550\,569\,112\,626\,598\,445\,807\,031\ddots\\
& \quad 437\,279\,472\,870\,817\,288\,862\,199\,784\,409\,091\,111\,537)
\end{aligned}
$$

$$\frac{\partial y(x)}{\partial x} = \left(\frac{1}{72\,254\,999\,240\,299\,898\,028\,638\,147\,856\,316\,105\,457\,874\,035\,846\,152\,192} - i/140\,877\,739\,668\,789\,949\,100\,683\,733\,740\,533\,342\,055\,272\,913\,530\,836\,563\ldots748\,718\,641\,152\right)x$$

-(13.12806e+39)/(1.94973e+13 – i*5 cosPi)^3 + (6.19631e+26)^2/(((1.94973e+13 + i*5 cosPi)(1.94973e+13 – i*5 cosPi)^3))

Input interpretation:

$$-\frac{13.12806\times 10^{39}}{\left(1.94973\times 10^{13}-(i\times 5)\cos(\pi)\right)^3}+\frac{\left(6.19631\times 10^{26}\right)^2}{\left(1.94973\times 10^{13}+i\times 5\cos(\pi)\right)\left(1.94973\times 10^{13}-(i\times 5)\cos(\pi)\right)^3}$$

i is the imaginary unit

Result:

$0.885619\ldots +$
$3.61874\ldots \times 10^{-20}\, i$

Alternate form:

0.885619

$\Psi_2 = 0.885619$

Note that:

123/(((-(13.12806e+39)/(1.94973e+13 – i*5 cosPi)^3 + (6.19631e+26)^2/(((1.94973e+13 + i*5 cosPi)(1.94973e+13 – i*5 cosPi)^3)))))+1/golden ratio

Input interpretation:

$$\frac{123}{-\frac{13.12806\times 10^{39}}{\left(1.94973\times 10^{13}-(i\times 5)\cos(\pi)\right)^3}+\frac{\left(6.19631\times 10^{26}\right)^2}{\left(1.94973\times 10^{13}+i\times 5\cos(\pi)\right)\left(1.94973\times 10^{13}-(i\times 5)\cos(\pi)\right)^3}}+\frac{1}{\phi}$$

i is the imaginary unit

ϕ is the golden ratio

Result:

139.504... −
5.67503... × 10^{-18} i

Alternate form:

139.504

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

123/(((-(13.12806e+39)/(1.94973e+13 – i*5 cosPi)^3 + (6.19631e+26)^2/(((1.94973e+13 + i*5 cosPi)(1.94973e+13 – i*5 cosPi)^3)))))-11-golden ratio^2

Input interpretation:

$$\frac{123}{-\frac{13.12806\times 10^{39}}{(1.94973\times 10^{13}-(i\times 5)\cos(\pi))^3}+\frac{(6.19631\times 10^{26})^2}{(1.94973\times 10^{13}+i\times 5\cos(\pi))(1.94973\times 10^{13}-(i\times 5)\cos(\pi))^3}}-11-\phi^2$$

i is the imaginary unit

ϕ is the golden ratio

Result:

125.268... −
5.67503... × 10^{-18} i

Alternate form:

125.268

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

For θ = π/2 , we obtain:

-(13.12806e+39)/(((((1.94973e+13 – i*5 cos(Pi/2)))^3))) + x^2/((((((1.94973e+13 + i*5 cos(Pi/2))))((((1.94973e+13 – i*5 cos(Pi/2))))^3)))) = 0

Input interpretation:

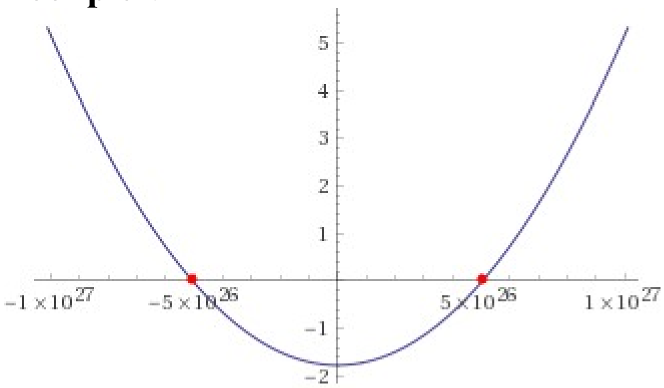
$$-\frac{13.12806\times 10^{39}}{\left(1.94973\times 10^{13}-(i\times 5)\cos\left(\frac{\pi}{2}\right)\right)^3}+\frac{x^2}{\left(1.94973\times 10^{13}+i\times 5\cos\left(\frac{\pi}{2}\right)\right)\left(1.94973\times 10^{13}-(i\times 5)\cos\left(\frac{\pi}{2}\right)\right)^3}=0$$

i is the imaginary unit

Result:

$$6.91994\times 10^{-54}\,x^2-1.77124=0$$

Root plot:



Alternate form:

$$(2.63058\times 10^{-27}\,x-1.33088)(2.63058\times 10^{-27}\,x+1.33088)=0$$

Solutions:

$$x=-505\,926\,599\,654\,534\,828\,691\,292\,160$$

$$x=505\,926\,599\,654\,534\,828\,691\,292\,160$$

Integer solution:

$$x=\pm 505\,926\,599\,654\,534\,897\,410\,768\,896$$

$$5.05926599654534828691292160\times 10^{26}$$

Q = 5.05926599...*10^{26}

-(13.12806e+39)/(((((1.94973e+13 – i*5 cos(Pi/2)))^3))) + (5.05926599e+26)^2/((((((1.94973e+13 + i*5 cos(Pi/2))))((((1.94973e+13 – i*5 cos(Pi/2))))^3))))

Input interpretation:

$$-\frac{13.12806\times 10^{39}}{\left(1.94973\times 10^{13}-(i\times 5)\cos\left(\frac{\pi}{2}\right)\right)^3}+\frac{\left(5.05926599\times 10^{26}\right)^2}{\left(1.94973\times 10^{13}+i\times 5\cos\left(\frac{\pi}{2}\right)\right)\left(1.94973\times 10^{13}-(i\times 5)\cos\left(\frac{\pi}{2}\right)\right)^3}$$

i is the imaginary unit

Result:

$-4.583026821420330528368718937996046603973054516903523... \times 10^{-9}$

Ψ_2 = -4.58302682…*10^{-9}

From: **Manuscript Book 2 of Srinivasa Ramanujan**

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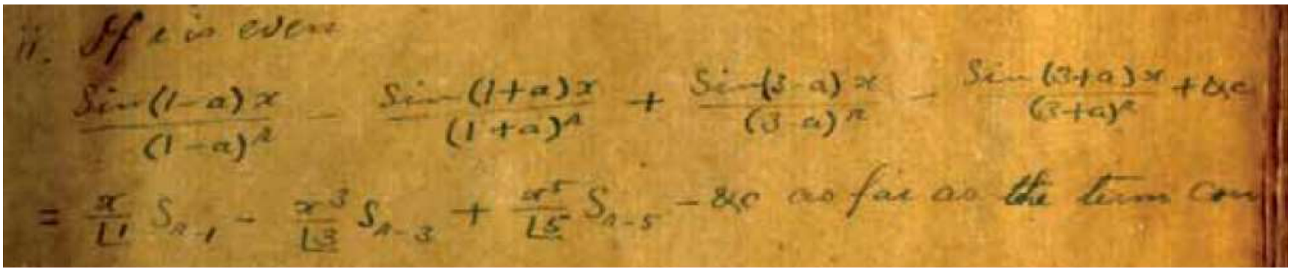
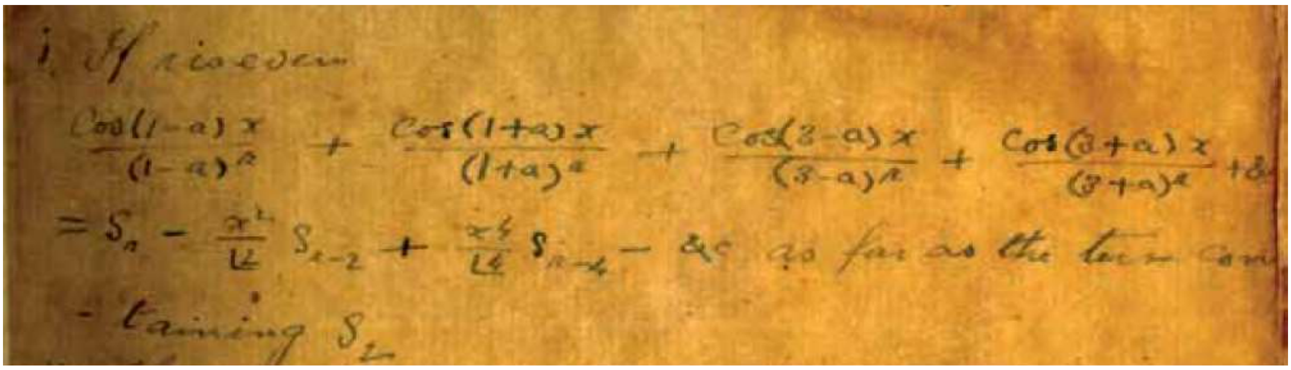


ii. If r is even

$$\frac{\sin(1-a)x}{(1-a)^r}-\frac{\sin(1+a)x}{(1+a)^r}+\frac{\sin(3-a)x}{(3-a)^r}-\frac{\sin(3+a)x}{(3+a)^r}+\&c$$

$$=\frac{x}{\lfloor 1}S_{r-1}-\frac{x^3}{\lfloor 3}S_{r-3}+\frac{x^5}{\lfloor 5}S_{r-5}-\&c$$ as far as the term con



i. If r is even

$$\frac{\cos(1-a)x}{(1-a)^r}+\frac{\cos(1+a)x}{(1+a)^r}+\frac{\cos(3-a)x}{(3-a)^r}+\frac{\cos(3+a)x}{(3+a)^r}+\&c$$

$$=S_r-\frac{x^2}{\lfloor 2}S_{r-2}+\frac{x^4}{\lfloor 4}S_{r-4}-\&c$$ as far as the term con-taining S_2

For a = 5 and r = 4, we obtain:

((sin(1-5)x / (1-5)^4)) – ((sin (1+5)x / (1+5)^4)) + ((sin (3-5)x / (3-5)^4)) – ((sin(3+5)x / (3+5)^4))

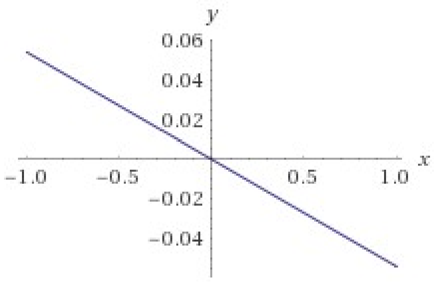
Input:

$$\sin(1-5)\times\frac{x}{(1-5)^4}-\sin(1+5)\times\frac{x}{(1+5)^4}+\sin(3-5)\times\frac{x}{(3-5)^4}-\sin(3+5)\times\frac{x}{(3+5)^4}$$

Exact result:

$$-\frac{x\sin(8)}{4096}-\frac{x\sin(6)}{1296}-\frac{1}{256}\,x\sin(4)-\frac{1}{16}\,x\sin(2)$$

Plot:



Geometric figure:

line

Alternate forms:

$$\frac{x(-20\,736\sin(2)-1296\sin(4)-256\sin(6)-81\sin(8))}{331\,776}$$

$$-\frac{x(20\,736\sin(2)+1296\sin(4)+256\sin(6)+81\sin(8))}{331\,776}$$

$$-\frac{x\sin(1)\cos(1)(10\,496+1377\cos(2)+256\cos(4)+81\cos(6))}{82\,944}$$

Properties as a real function:

Domain

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

Range

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

Bijectivity

bijective from its domain to ℝ

Parity

odd

ℝ is the set of real numbers

Derivative:

$$\frac{d}{dx}\left(\frac{\sin(1-5)\,x}{(1-5)^4}-\frac{\sin(1+5)\,x}{(1+5)^4}+\frac{\sin(3-5)\,x}{(3-5)^4}-\frac{\sin(3+5)\,x}{(3+5)^4}\right)=$$
$$\frac{1}{256}\sin(1-5)+\frac{1}{16}\sin(3-5)-\frac{\sin(8)}{4096}-\frac{\sin(6)}{1296}$$

Indefinite integral:

$$\int\left(-\frac{1}{16}\,x\sin(2)-\frac{1}{256}\,x\sin(4)-\frac{x\sin(6)}{1296}-\frac{x\sin(8)}{4096}\right)dx=$$
$$-\frac{x^2\sin(8)}{8192}-\frac{x^2\sin(6)}{2592}-\frac{1}{512}\,x^2\sin(4)-\frac{1}{32}\,x^2\sin(2)+\text{constant}$$

For x = 12, we obtain:

((sin(1-5)12 / (1-5)^4)) – ((sin (1+5)12 / (1+5)^4)) + ((sin (3-5)12 / (3-5)^4)) – ((sin(3+5)12 / (3+5)^4))

Input:

$$\sin(1-5)\times\frac{12}{(1-5)^4}-\sin(1+5)\times\frac{12}{(1+5)^4}+\sin(3-5)\times\frac{12}{(3-5)^4}-\sin(3+5)\times\frac{12}{(3+5)^4}$$

Exact result:

$$-\frac{3\sin(2)}{4}-\frac{3\sin(4)}{64}-\frac{\sin(6)}{108}-\frac{3\sin(8)}{1024}$$

Decimal approximation:

−0.64680928310097763029932101744009815813984661625584745765...

-0.6468092831…

Property:

$$-\frac{3\sin(2)}{4}-\frac{3\sin(4)}{64}-\frac{\sin(6)}{108}-\frac{3\sin(8)}{1024}\text{ is a transcendental number}$$

Alternate forms:

$$\frac{-20\,736\sin(2)-1296\sin(4)-256\sin(6)-81\sin(8)}{27\,648}$$

$$-\frac{\sin(1)\cos(1)\,(10\,496+1377\cos(2)+256\cos(4)+81\cos(6))}{6912}$$

$$\frac{-1296\sin(2)-81\sin(4)-16\sin(6)}{1728}-\frac{3\sin(8)}{1024}$$

Alternative representations:

$$\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}=\frac{12}{\csc(-4)\,(-4)^4}+\frac{12}{\csc(-2)\,(-2)^4}-\frac{12}{\csc(6)\,6^4}-\frac{12}{\csc(8)\,8^4}$$

$$\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}=\frac{12\cos\left(4+\frac{\pi}{2}\right)}{(-4)^4}+\frac{12\cos\left(2+\frac{\pi}{2}\right)}{(-2)^4}-\frac{12\cos\left(-6+\frac{\pi}{2}\right)}{6^4}-\frac{12\cos\left(-8+\frac{\pi}{2}\right)}{8^4}$$

$$\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}=-\frac{12\cos\left(-4+\frac{\pi}{2}\right)}{(-4)^4}-\frac{12\cos\left(-2+\frac{\pi}{2}\right)}{(-2)^4}+\frac{12\cos\left(6+\frac{\pi}{2}\right)}{6^4}+\frac{12\cos\left(8+\frac{\pi}{2}\right)}{8^4}$$

Series representations:

$$\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}=\sum_{k=0}^{\infty}-\frac{(-1)^k\,2^{-7+2k}\left(1728+27\times 2^{3+2k}+64\times 9^k+27\times 16^k\right)}{9\,(1+2k)!}$$

$$\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}=\sum_{k=0}^{\infty}-\frac{\sin\left(\frac{k\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)}{27\,648\,k!}$$

$$\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}=\sum_{k=0}^{\infty}-\frac{(-1)^k\left(20\,736\left(2-\frac{\pi}{2}\right)^{2k}+1296\left(4-\frac{\pi}{2}\right)^{2k}+256\left(6-\frac{\pi}{2}\right)^{2k}+81\left(8-\frac{\pi}{2}\right)^{2k}\right)}{27\,648\,(2k)!}$$

Integral representations:

$$\frac{\sin(1-5)\,12}{(1-5)^4} - \frac{\sin(1+5)\,12}{(1+5)^4} + \frac{\sin(3-5)\,12}{(3-5)^4} - \frac{\sin(3+5)\,12}{(3+5)^4} = \int_0^1 \left(-\frac{3}{2}\cos(2t) - \frac{3}{16}\cos(4t) - \frac{1}{18}\cos(6t) - \frac{3}{128}\cos(8t)\right)dt$$

$$\frac{\sin(1-5)\,12}{(1-5)^4} - \frac{\sin(1+5)\,12}{(1+5)^4} + \frac{\sin(3-5)\,12}{(3-5)^4} - \frac{\sin(3+5)\,12}{(3+5)^4} = \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{i\,e^{-16/s+s}\left(27 + 64\,e^{7/s} + 216\,e^{12/s} + 1728\,e^{15/s}\right)}{4608\sqrt{\pi}\,s^{3/2}}\,ds \quad \text{for } \gamma > 0$$

$$\frac{\sin(1-5)\,12}{(1-5)^4} - \frac{\sin(1+5)\,12}{(1+5)^4} + \frac{\sin(3-5)\,12}{(3-5)^4} - \frac{\sin(3+5)\,12}{(3+5)^4} = \int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{i\,2^{-9-4s} \times 9^{-1-s}\left(3^{3+2s} + 4^{3+2s} + 6^{3+2s} + 12^{3+2s}\right)\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{3}{2}-s\right)}\,ds \quad \text{for } 0 < \gamma < 1$$

From which:

-[-1+((((sin(1-5)12 / (1-5)^4)) – ((sin (1+5)12 / (1+5)^4)) + ((sin (3-5)12 / (3-5)^4)) – ((sin(3+5)12 / (3+5)^4))))]

Input:

$$-\left(-1 + \left(\sin(1-5) \times \frac{12}{(1-5)^4} - \sin(1+5) \times \frac{12}{(1+5)^4} + \sin(3-5) \times \frac{12}{(3-5)^4} - \sin(3+5) \times \frac{12}{(3+5)^4}\right)\right)$$

Exact result:

$$1 + \frac{3\sin(2)}{4} + \frac{3\sin(4)}{64} + \frac{\sin(6)}{108} + \frac{3\sin(8)}{1024}$$

Decimal approximation:

1.646809283100977630299321017440098158139846616255847457653...

$1.6468092831\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Property:

$1 + \frac{3\sin(2)}{4} + \frac{3\sin(4)}{64} + \frac{\sin(6)}{108} + \frac{3\sin(8)}{1024}$ is a transcendental number

Alternate forms:

$$\frac{27648 + 20736 \sin(2) + 1296 \sin(4) + 256 \sin(6) + 81 \sin(8)}{27648}$$

$$\frac{1728 + 1296 \sin(2) + 81 \sin(4) + 16 \sin(6)}{1728} + \frac{3 \sin(8)}{1024}$$

$$\frac{20736 \sin(2) + 1296 \sin(4) + 256 \sin(6) + 27 (1024 + 3 \sin(8))}{27648}$$

Alternative representations:

$$-\left(-1 + \left(\frac{\sin(1-5)\, 12}{(1-5)^4} - \frac{\sin(1+5)\, 12}{(1+5)^4} + \frac{\sin(3-5)\, 12}{(3-5)^4} - \frac{\sin(3+5)\, 12}{(3+5)^4}\right)\right) = 1 - \frac{12}{\csc(-4)\,(-4)^4} - \frac{12}{\csc(-2)\,(-2)^4} + \frac{12}{\csc(6)\, 6^4} + \frac{12}{\csc(8)\, 8^4}$$

$$-\left(-1 + \left(\frac{\sin(1-5)\, 12}{(1-5)^4} - \frac{\sin(1+5)\, 12}{(1+5)^4} + \frac{\sin(3-5)\, 12}{(3-5)^4} - \frac{\sin(3+5)\, 12}{(3+5)^4}\right)\right) = 1 - \frac{12 \cos\left(4 + \frac{\pi}{2}\right)}{(-4)^4} - \frac{12 \cos\left(2 + \frac{\pi}{2}\right)}{(-2)^4} + \frac{12 \cos\left(-6 + \frac{\pi}{2}\right)}{6^4} + \frac{12 \cos\left(-8 + \frac{\pi}{2}\right)}{8^4}$$

$$-\left(-1 + \left(\frac{\sin(1-5)\, 12}{(1-5)^4} - \frac{\sin(1+5)\, 12}{(1+5)^4} + \frac{\sin(3-5)\, 12}{(3-5)^4} - \frac{\sin(3+5)\, 12}{(3+5)^4}\right)\right) = 1 + \frac{12 \cos\left(-4 + \frac{\pi}{2}\right)}{(-4)^4} + \frac{12 \cos\left(-2 + \frac{\pi}{2}\right)}{(-2)^4} - \frac{12 \cos\left(6 + \frac{\pi}{2}\right)}{6^4} - \frac{12 \cos\left(8 + \frac{\pi}{2}\right)}{8^4}$$

Series representations:

$$-\left(-1 + \left(\frac{\sin(1-5)\, 12}{(1-5)^4} - \frac{\sin(1+5)\, 12}{(1+5)^4} + \frac{\sin(3-5)\, 12}{(3-5)^4} - \frac{\sin(3+5)\, 12}{(3+5)^4}\right)\right) = 1 + \sum_{k=0}^{\infty} \frac{(-1)^k\, 2^{-7+2k} \left(1728 + 27 \times 2^{3+2k} + 64 \times 9^k + 27 \times 16^k\right)}{9\,(1+2k)!}$$

$$-\left(-1 + \left(\frac{\sin(1-5)\, 12}{(1-5)^4} - \frac{\sin(1+5)\, 12}{(1+5)^4} + \frac{\sin(3-5)\, 12}{(3-5)^4} - \frac{\sin(3+5)\, 12}{(3+5)^4}\right)\right) = 1 + \sum_{k=0}^{\infty} \frac{\sin\left(\frac{k\pi}{2} + z_0\right) \left(20736\,(2-z_0)^k + 1296\,(4-z_0)^k + 256\,(6-z_0)^k + 81\,(8-z_0)^k\right)}{27648\, k!}$$

$$-\left(-1 + \left(\frac{\sin(1-5)\, 12}{(1-5)^4} - \frac{\sin(1+5)\, 12}{(1+5)^4} + \frac{\sin(3-5)\, 12}{(3-5)^4} - \frac{\sin(3+5)\, 12}{(3+5)^4}\right)\right) = 1 + \sum_{k=0}^{\infty} \frac{(-1)^k \left(20736 \left(2 - \frac{\pi}{2}\right)^{2k} + 1296 \left(4 - \frac{\pi}{2}\right)^{2k} + 256 \left(6 - \frac{\pi}{2}\right)^{2k} + 81 \left(8 - \frac{\pi}{2}\right)^{2k}\right)}{27648\,(2k)!}$$

Integral representations:

$$-\left(-1+\left(\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}\right)\right)= 1+\int_0^1\left(\frac{3}{2}\cos(2t)+\frac{3}{16}\cos(4t)+\frac{1}{18}\cos(6t)+\frac{3}{128}\cos(8t)\right)dt$$

$$-\left(-1+\left(\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}\right)\right)= 1+\int_{-i\infty+\gamma}^{i\infty+\gamma}-\frac{i\,e^{-16/s+s}\left(27+64\,e^{7/s}+216\,e^{12/s}+1728\,e^{15/s}\right)}{4608\sqrt{\pi}\,s^{3/2}}\,ds \quad \text{for } \gamma>0$$

$$-\left(-1+\left(\frac{\sin(1-5)\,12}{(1-5)^4}-\frac{\sin(1+5)\,12}{(1+5)^4}+\frac{\sin(3-5)\,12}{(3-5)^4}-\frac{\sin(3+5)\,12}{(3+5)^4}\right)\right)= 1+\int_{-i\infty+\gamma}^{i\infty+\gamma}-\frac{i\,2^{-9-4s}\times 9^{-1-s}\left(3^{3+2s}+4^{3+2s}+6^{3+2s}+12^{3+2s}\right)\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{3}{2}-s\right)}\,ds \quad \text{for } 0<\gamma<1$$

For x = 16, we obtain:

-(((((((sin(1-5)16 / (1-5)^4)) – ((sin (1+5)16 / (1+5)^4)) + ((sin (3-5)16 / (3-5)^4)) – ((sin(3+5)16 / (3+5)^4)))) - 24*1/10^3)))

Input:

$$-\left(\left(\sin(1-5)\times\frac{16}{(1-5)^4}-\sin(1+5)\times\frac{16}{(1+5)^4}+\sin(3-5)\times\frac{16}{(3-5)^4}-\sin(3+5)\times\frac{16}{(3+5)^4}\right)-24\times\frac{1}{10^3}\right)$$

Exact result:

$$\frac{3}{125}+\sin(2)+\frac{\sin(4)}{16}+\frac{\sin(6)}{81}+\frac{\sin(8)}{256}$$

Decimal approximation:

0.886412377467970173732428023253464210853128821674463276871...

0.88641237746…

Property:

$\frac{3}{125}+\sin(2)+\frac{\sin(4)}{16}+\frac{\sin(6)}{81}+\frac{\sin(8)}{256}$ is a transcendental number

Alternate forms:

$$\frac{62\,208+2\,592\,000\sin(2)+162\,000\sin(4)+32\,000\sin(6)+10\,125\sin(8)}{2\,592\,000}$$

$$\frac{3888+162\,000\sin(2)+10\,125\sin(4)+2000\sin(6)}{162\,000}+\frac{\sin(8)}{256}$$

$$\frac{2\,592\,000\sin(2)+162\,000\sin(4)+32\,000\sin(6)+81\,(768+125\sin(8))}{2\,592\,000}$$

Alternative representations:

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)= -\frac{16}{\csc(-4)\,(-4)^4}-\frac{16}{\csc(-2)\,(-2)^4}+\frac{16}{\csc(6)\,6^4}+\frac{16}{\csc(8)\,8^4}+\frac{24}{10^3}$$

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)= -\frac{16\cos\left(4+\frac{\pi}{2}\right)}{(-4)^4}-\frac{16\cos\left(2+\frac{\pi}{2}\right)}{(-2)^4}+\frac{16\cos\left(-6+\frac{\pi}{2}\right)}{6^4}+\frac{16\cos\left(-8+\frac{\pi}{2}\right)}{8^4}+\frac{24}{10^3}$$

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)= \frac{16\cos\left(-4+\frac{\pi}{2}\right)}{(-4)^4}+\frac{16\cos\left(-2+\frac{\pi}{2}\right)}{(-2)^4}-\frac{16\cos\left(6+\frac{\pi}{2}\right)}{6^4}-\frac{16\cos\left(8+\frac{\pi}{2}\right)}{8^4}+\frac{24}{10^3}$$

Series representations:

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)= \frac{3}{125}+\sum_{k=0}^{\infty}\frac{(-1)^k\,2^{-5+2k}\left(1728+27\times 2^{3+2k}+64\times 9^k+27\times 16^k\right)}{27\,(1+2k)!}$$

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)= \frac{3}{125}+\sum_{k=0}^{\infty}\frac{\sin\left(\frac{k\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)}{20\,736\,k!}$$

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)= \frac{3}{125}+\sum_{k=0}^{\infty}\frac{(-1)^k\left(20\,736\left(2-\frac{\pi}{2}\right)^{2k}+1296\left(4-\frac{\pi}{2}\right)^{2k}+256\left(6-\frac{\pi}{2}\right)^{2k}+81\left(8-\frac{\pi}{2}\right)^{2k}\right)}{20\,736\,(2k)!}$$

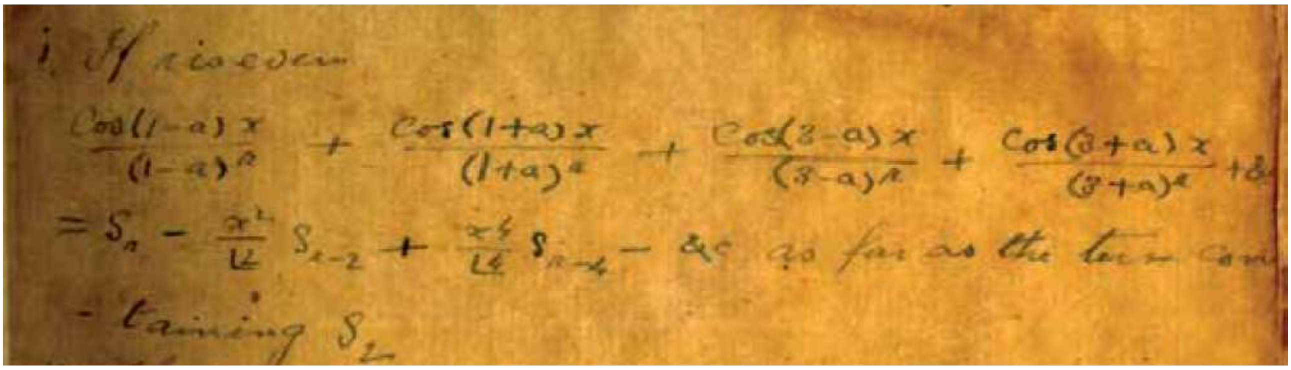
Integral representations:

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)=\frac{3}{125}+\int_0^1\left(2\cos(2t)+\frac{1}{4}\cos(4t)+\frac{2}{27}\cos(6t)+\frac{1}{32}\cos(8t)\right)dt$$

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)=\frac{3}{125}+\int_{-i\infty+\gamma}^{i\infty+\gamma}-\frac{i\,e^{-16/s+s}\left(27+64\,e^{7/s}+216\,e^{12/s}+1728\,e^{15/s}\right)}{3456\sqrt{\pi}\,s^{3/2}}\,ds \quad \text{for } \gamma>0$$

$$-\left(\left(\frac{\sin(1-5)\,16}{(1-5)^4}-\frac{\sin(1+5)\,16}{(1+5)^4}+\frac{\sin(3-5)\,16}{(3-5)^4}-\frac{\sin(3+5)\,16}{(3+5)^4}\right)-\frac{24}{10^3}\right)=\frac{3}{125}+\int_{-i\infty+\gamma}^{i\infty+\gamma}-\frac{i\,2^{-7-4s}\times 3^{-3-2s}\left(3^{3+2s}+4^{3+2s}+6^{3+2s}+12^{3+2s}\right)\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{3}{2}-s\right)}\,ds \quad \text{for } 0<\gamma<1$$

Now:


i. If r is even

$$\frac{\cos(1-a)x}{(1-a)^r}+\frac{\cos(1+a)x}{(1+a)^r}+\frac{\cos(3-a)x}{(3-a)^r}+\frac{\cos(3+a)x}{(3+a)^r}+\&c$$

$= S_r - \frac{x^2}{\lfloor 2} S_{r-2} + \frac{x^4}{\lfloor 4} S_{r-4} - \&c$ as far as the term containing S_2

For x = 12, a = 5 and r = 4, we obtain:

((cos(1-5)12 / (1-5)^4)) + ((cos (1+5)12 / (1+5)^4)) + ((cos (3-5)12 / (3-5)^4)) + ((cos(3+5)12 / (3+5)^4))

Input:

$$\cos(1-5)\times\frac{12}{(1-5)^4}+\cos(1+5)\times\frac{12}{(1+5)^4}+\cos(3-5)\times\frac{12}{(3-5)^4}+\cos(3+5)\times\frac{12}{(3+5)^4}$$

Exact result:

$$\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}$$

Decimal approximation:

$-0.3342854761515042524772000121485296362416495941452244528 1\ldots$

-0.334285476…

Property:

$\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}$ is a transcendental number

Alternate forms:

$$\frac{20736\cos(2)+1296\cos(4)+256\cos(6)+81\cos(8)}{27648}$$

$$\frac{1296\cos(2)+81\cos(4)+16\cos(6)}{1728}+\frac{3\cos(8)}{1024}$$

$$\frac{3e^{-2i}}{8}+\frac{3e^{2i}}{8}+\frac{3e^{-4i}}{128}+\frac{3e^{4i}}{128}+\frac{e^{-6i}}{216}+\frac{e^{6i}}{216}+\frac{3e^{-8i}}{2048}+\frac{3e^{8i}}{2048}$$

Alternative representations:

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\frac{12\cosh(4i)}{(-4)^4}+\frac{12\cosh(2i)}{(-2)^4}+\frac{12\cosh(-6i)}{6^4}+\frac{12\cosh(-8i)}{8^4}$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\frac{12\cosh(-4i)}{(-4)^4}+\frac{12\cosh(-2i)}{(-2)^4}+\frac{12\cosh(6i)}{6^4}+\frac{12\cosh(8i)}{8^4}$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\frac{12}{(-4)^4\sec(-4)}+\frac{12}{(-2)^4\sec(-2)}+\frac{12}{6^4\sec(6)}+\frac{12}{8^4\sec(8)}$$

Series representations:

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\sum_{k=0}^{\infty}\frac{(-1)^k\,4^{-5+k}\left(20736+81\times 4^{2+k}+256\times 9^k+81\times 16^k\right)}{27\,(2k)!}$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\sum_{k=0}^{\infty}\frac{\cos\left(\frac{k\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)}{27\,648\,k!}$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\sum_{k=0}^{\infty}\left(\frac{3\,(-1)^{-1+k}\left(2-\frac{\pi}{2}\right)^{1+2k}}{4\,(1+2k)!}+\frac{3\,(-1)^{-1+k}\left(4-\frac{\pi}{2}\right)^{1+2k}}{64\,(1+2k)!}+\frac{(-1)^{-1+k}\left(6-\frac{\pi}{2}\right)^{1+2k}}{108\,(1+2k)!}+\frac{3\,(-1)^{-1+k}\left(8-\frac{\pi}{2}\right)^{1+2k}}{1024\,(1+2k)!}\right)$$

Integral representations:

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\frac{22\,369}{27\,648}+\int_0^1\left(-\frac{3}{2}\sin(2t)-\frac{3}{16}\sin(4t)-\frac{1}{18}\sin(6t)-\frac{3}{128}\sin(8t)\right)dt$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\int_{-i\infty+\gamma}^{i\infty+\gamma}-\frac{i\,e^{-16/s+s}\left(81+256\,e^{7/s}+1296\,e^{12/s}+20\,736\,e^{15/s}\right)}{55\,296\sqrt{\pi}\,\sqrt{s}}\,ds\quad\text{for }\gamma>0$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=\int_{-i\infty+\gamma}^{i\infty+\gamma}-\frac{i\,2^{-11-4s}\times 3^{-3-2s}\left(9^{2+s}+16^{2+s}+36^{2+s}+144^{2+s}\right)\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{1}{2}-s\right)}\,ds\quad\text{for }0<\gamma<\frac{1}{2}$$

$$\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}=$$

$$\int_{\frac{\pi}{2}}^{6}\left(-\frac{\sin(t)}{108}-\frac{3\left(8-\frac{\pi}{2}\right)\sin\left(\frac{\pi-8t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)}{1024\left(6-\frac{\pi}{2}\right)}+\frac{\left(2-\frac{\pi}{2}\right)\left(-\frac{3}{4}\sin\left(\frac{-2\pi-2t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)-\frac{3\left(4-\frac{\pi}{2}\right)\sin\left(\frac{\pi-\frac{4\left(-2\pi-2t+\frac{\pi t}{2}\right)}{-6+\frac{\pi}{2}}+\frac{\pi\left(-2\pi-2t+\frac{\pi t}{2}\right)}{2\left(-6+\frac{\pi}{2}\right)}}{-2+\frac{\pi}{2}}\right)}{64\left(2-\frac{\pi}{2}\right)}\right)}{6-\frac{\pi}{2}}\right)dt$$

$\Gamma(x)$ is the gamma function

-(((((((cos(1-5)12 / (1-5)^4)) + ((cos (1+5)12 / (1+5)^4)) + ((cos (3-5)12 / (3-5)^4)) + ((cos(3+5)12 / (3+5)^4))))-55*1/10^2)))

Input:

$$-\left(\left(\cos(1-5)\times\frac{12}{(1-5)^4}+\cos(1+5)\times\frac{12}{(1+5)^4}+\cos(3-5)\times\frac{12}{(3-5)^4}+\cos(3+5)\times\frac{12}{(3+5)^4}\right)-55\times\frac{1}{10^2}\right)$$

Exact result:

$$\frac{11}{20}-\frac{3\cos(2)}{4}-\frac{3\cos(4)}{64}-\frac{\cos(6)}{108}-\frac{3\cos(8)}{1024}$$

Decimal approximation:

0.884285476151504252477200012148529636241649594145224452812...

0.88428547615…

Property:

$\frac{11}{20}-\frac{3\cos(2)}{4}-\frac{3\cos(4)}{64}-\frac{\cos(6)}{108}-\frac{3\cos(8)}{1024}$ is a transcendental number

Alternate forms:

$$\frac{76\,032-103\,680\cos(2)-6480\cos(4)-1280\cos(6)-405\cos(8)}{138\,240}$$

$$\frac{4752-6480\cos(2)-405\cos(4)-80\cos(6)}{8640}-\frac{3\cos(8)}{1024}$$

$$\frac{-103\,680\cos(2)-6480\cos(4)-1280\cos(6)-27\,(15\cos(8)-2816)}{138\,240}$$

Alternative representations:

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)= -\frac{12\cosh(4\,i)}{(-4)^4}-\frac{12\cosh(2\,i)}{(-2)^4}-\frac{12\cosh(-6\,i)}{6^4}-\frac{12\cosh(-8\,i)}{8^4}+\frac{55}{10^2}$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)= -\frac{12\cosh(-4\,i)}{(-4)^4}-\frac{12\cosh(-2\,i)}{(-2)^4}-\frac{12\cosh(6\,i)}{6^4}-\frac{12\cosh(8\,i)}{8^4}+\frac{55}{10^2}$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)= \frac{55}{10^2}-\frac{12}{(-4)^4\sec(-4)}-\frac{12}{(-2)^4\sec(-2)}-\frac{12}{6^4\sec(6)}-\frac{12}{8^4\sec(8)}$$

Series representations:

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$
$$\frac{11}{20}+\sum_{k=0}^{\infty}-\frac{(-1)^k\,4^{-5+k}\left(20\,736+81\times 4^{2+k}+256\times 9^k+81\times 16^k\right)}{27\,(2\,k)!}$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$
$$\frac{11}{20}+\sum_{k=0}^{\infty}-\frac{\cos\left(\frac{k\,\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)}{27\,648\,k!}$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$
$$\frac{11}{20}+\sum_{k=0}^{\infty}\left(-\frac{3\,(-1)^{-1+k}\left(2-\frac{\pi}{2}\right)^{1+2\,k}}{4\,(1+2\,k)!}-\frac{3\,(-1)^{-1+k}\left(4-\frac{\pi}{2}\right)^{1+2\,k}}{64\,(1+2\,k)!}-\frac{(-1)^{-1+k}\left(6-\frac{\pi}{2}\right)^{1+2\,k}}{108\,(1+2\,k)!}-\frac{3\,(-1)^{-1+k}\left(8-\frac{\pi}{2}\right)^{1+2\,k}}{1024\,(1+2\,k)!}\right)$$

Integral representations:

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$
$$-\frac{35\,813}{138\,240}+\int_0^1\left(3\cos(t)\sin(t)+\frac{3}{16}\sin(4\,t)+\frac{1}{18}\sin(6\,t)+\frac{3}{128}\sin(8\,t)\right)dt$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$
$$\frac{11}{20}+\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{i\,e^{-16/s+s}\left(81+256\,e^{7/s}+1296\,e^{12/s}+20\,736\,e^{15/s}\right)}{55\,296\,\sqrt{\pi}\,\sqrt{s}}\,ds\quad\text{for }\gamma>0$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$
$$\frac{11}{20}+\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{i\,2^{-11-4\,s}\times 3^{-3-2\,s}\left(9^{2+s}+16^{2+s}+36^{2+s}+144^{2+s}\right)\Gamma(s)}{\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}\,ds\quad\text{for }0<\gamma<\frac{1}{2}$$

$$-\left(\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)-\frac{55}{10^2}\right)=$$

$$\frac{11}{20}+\int_{\frac{\pi}{2}}^{6}\left(\frac{\sin(t)}{108}+\frac{3\left(8-\frac{\pi}{2}\right)\sin\left(\frac{\pi-8t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)}{1024\left(6-\frac{\pi}{2}\right)}+\frac{\left(2-\frac{\pi}{2}\right)\left(\frac{3}{4}\sin\left(\frac{-2\pi-2t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)+\frac{3\left(4-\frac{\pi}{2}\right)\sin\left(\frac{\pi-\frac{4\left(-2\pi-2t+\frac{\pi t}{2}\right)}{-6+\frac{\pi}{2}}+\frac{\pi\left(-2\pi-2t+\frac{\pi t}{2}\right)}{2\left(-6+\frac{\pi}{2}\right)}}{-2+\frac{\pi}{2}}\right)}{64\left(2-\frac{\pi}{2}\right)}\right)}{6-\frac{\pi}{2}}\right)dt$$

1-2(((((cos(1-5)12 / (1-5)^4)) + ((cos (1+5)12 / (1+5)^4)) + ((cos (3-5)12 / (3-5)^4)) + ((cos(3+5)12 / (3+5)^4)))))

Input:

$$1-2\left(\cos(1-5)\times\frac{12}{(1-5)^4}+\cos(1+5)\times\frac{12}{(1+5)^4}+\cos(3-5)\times\frac{12}{(3-5)^4}+\cos(3+5)\times\frac{12}{(3+5)^4}\right)$$

Exact result:

$$1-2\left(\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}\right)$$

Decimal approximation:

1.668570952303008504954400024297059272483299188290448905624...

1.6685709523…

Property:

$1-2\left(\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}\right)$ is a transcendental number

Alternate forms:

$$\frac{13824-20736\cos(2)-1296\cos(4)-256\cos(6)-81\cos(8)}{13824}$$

$$1-\frac{3\cos(2)}{2}-\frac{3\cos(4)}{32}-\frac{\cos(6)}{54}-\frac{3\cos(8)}{512}$$

$$\frac{1}{864}(864-1296\cos(2)-81\cos(4)-16\cos(6))-\frac{3\cos(8)}{512}$$

Alternative representations:

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=1-2\left(\frac{12\cosh(4i)}{(-4)^4}+\frac{12\cosh(2i)}{(-2)^4}+\frac{12\cosh(-6i)}{6^4}+\frac{12\cosh(-8i)}{8^4}\right)$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=1-2\left(\frac{12\cosh(-4i)}{(-4)^4}+\frac{12\cosh(-2i)}{(-2)^4}+\frac{12\cosh(6i)}{6^4}+\frac{12\cosh(8i)}{8^4}\right)$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=$$
$$1-2\left(\frac{12}{(-4)^4\sec(-4)}+\frac{12}{(-2)^4\sec(-2)}+\frac{12}{6^4\sec(6)}+\frac{12}{8^4\sec(8)}\right)$$

Series representations:

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=$$
$$1+\sum_{k=0}^{\infty}\frac{(-1)^{1+k}\,2^{-9+2k}\left(20\,736+81\times 4^{2+k}+256\times 9^k+81\times 16^k\right)}{27\,(2k)!}$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=$$
$$1+\sum_{k=0}^{\infty}-\frac{\cos\left(\frac{k\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)}{13\,824\,k!}$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=$$
$$1+\sum_{k=0}^{\infty}\left(-\frac{3\,(-1)^{-1+k}\left(2-\frac{\pi}{2}\right)^{1+2k}}{2\,(1+2k)!}-\frac{3\,(-1)^{-1+k}\left(4-\frac{\pi}{2}\right)^{1+2k}}{32\,(1+2k)!}-\frac{(-1)^{-1+k}\left(6-\frac{\pi}{2}\right)^{1+2k}}{54\,(1+2k)!}-\frac{3\,(-1)^{-1+k}\left(8-\frac{\pi}{2}\right)^{1+2k}}{512\,(1+2k)!}\right)$$

Integral representations:

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=$$
$$-\frac{8545}{13\,824}+\int_0^1\left(3\sin(2t)+\frac{3}{8}\sin(4t)+\frac{1}{9}\sin(6t)+\frac{3}{64}\sin(8t)\right)dt$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)=$$
$$1+\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{i\,e^{-16/s+s}\left(81+256\,e^{7/s}+1296\,e^{12/s}+20\,736\,e^{15/s}\right)}{27\,648\sqrt{\pi}\sqrt{s}}\,ds\quad\text{for }\gamma>0$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)= 1+\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\left(\frac{3\,i\,\Gamma(s)}{4\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}+\frac{3\,i\,2^{-6-2\,s}\;\Gamma(s)}{\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}+\frac{i\,3^{-3-2\,s}\;\Gamma(s)}{4\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}+\frac{3\,i\,4^{-5-2\,s}\;\Gamma(s)}{\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}\right)ds \quad \text{for } 0<\gamma<\frac{1}{2}$$

$$1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)= 1+\int_{\frac{\pi}{2}}^{6}\left(\frac{\sin(t)}{54}+\frac{3\left(8-\frac{\pi}{2}\right)\sin\left(\frac{\pi-8\,t+\frac{\pi\,t}{2}}{-6+\frac{\pi}{2}}\right)}{512\left(6-\frac{\pi}{2}\right)}+\frac{\left(2-\frac{\pi}{2}\right)\left(\frac{3}{2}\sin\left(\frac{-2\,\pi-2\,t+\frac{\pi\,t}{2}}{-6+\frac{\pi}{2}}\right)+\frac{3\left(4-\frac{\pi}{2}\right)\sin\left(\frac{\pi-\frac{4\left(-2\,\pi-2\,t+\frac{\pi\,t}{2}\right)}{-6+\frac{\pi}{2}}+\frac{\pi\left(-2\,\pi-2\,t+\frac{\pi\,t}{2}\right)}{2\left(-6+\frac{\pi}{2}\right)}}{-2+\frac{\pi}{2}}\right)}{32\left(2-\frac{\pi}{2}\right)}\right)}{6-\frac{\pi}{2}}\right)dt$$

(((((1-2(((((cos(1-5)12 / (1-5)^4)) + ((cos (1+5)12 / (1+5)^4)) + ((cos (3-5)12 / (3-5)^4)) + ((cos(3+5)12 / (3+5)^4)))))))))-(47+3)*1/10^3

Input:

$$\left(1-2\left(\cos(1-5)\times\frac{12}{(1-5)^4}+\cos(1+5)\times\frac{12}{(1+5)^4}+\cos(3-5)\times\frac{12}{(3-5)^4}+\cos(3+5)\times\frac{12}{(3+5)^4}\right)\right)-(47+3)\times\frac{1}{10^3}$$

Exact result:

$$\frac{19}{20}-2\left(\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}\right)$$

Decimal approximation:

1.618570952303008504954400024297059272483299188290448905624...

1.6185709523… result that is a very good approximation to the value of the golden ratio 1,618033988749...

Property:

$$\frac{19}{20}-2\left(\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}\right)$$ is a transcendental number

Alternate forms:

$$\frac{65\,664-103\,680\cos(2)-6480\cos(4)-1280\cos(6)-405\cos(8)}{69\,120}$$

$$\frac{4104-6480\cos(2)-405\cos(4)-80\cos(6)}{4320}-\frac{3\cos(8)}{512}$$

$$\frac{19}{20}-\frac{3\cos(2)}{2}-\frac{3\cos(4)}{32}-\frac{\cos(6)}{54}-\frac{3\cos(8)}{512}$$

Alternative representations:

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$1-2\left(\frac{12\cosh(4\,i)}{(-4)^4}+\frac{12\cosh(2\,i)}{(-2)^4}+\frac{12\cosh(-6\,i)}{6^4}+\frac{12\cosh(-8\,i)}{8^4}\right)-\frac{50}{10^3}$$

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$1-2\left(\frac{12\cosh(-4\,i)}{(-4)^4}+\frac{12\cosh(-2\,i)}{(-2)^4}+\frac{12\cosh(6\,i)}{6^4}+\frac{12\cosh(8\,i)}{8^4}\right)-\frac{50}{10^3}$$

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$1-\frac{50}{10^3}-2\left(\frac{12}{(-4)^4\sec(-4)}+\frac{12}{(-2)^4\sec(-2)}+\frac{12}{6^4\sec(6)}+\frac{12}{8^4\sec(8)}\right)$$

Series representations:

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$\frac{19}{20}+\sum_{k=0}^{\infty}\frac{(-1)^{1+k}\,2^{-9+2k}\left(20\,736+81\times 4^{2+k}+256\times 9^k+81\times 16^k\right)}{27\,(2k)!}$$

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$\frac{19}{20}+\sum_{k=0}^{\infty}-\frac{\cos\left(\frac{k\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)}{13\,824\,k!}$$

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$\frac{19}{20}+\sum_{k=0}^{\infty}\left(-\frac{3\,(-1)^{-1+k}\left(2-\frac{\pi}{2}\right)^{1+2k}}{2\,(1+2k)!}-\frac{3\,(-1)^{-1+k}\left(4-\frac{\pi}{2}\right)^{1+2k}}{32\,(1+2k)!}-\frac{(-1)^{-1+k}\left(6-\frac{\pi}{2}\right)^{1+2k}}{54\,(1+2k)!}-\frac{3\,(-1)^{-1+k}\left(8-\frac{\pi}{2}\right)^{1+2k}}{512\,(1+2k)!}\right)$$

Integral representations:

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$-\frac{46\,181}{69\,120}+\int_0^1\left(3\sin(2t)+\frac{3}{8}\sin(4t)+\frac{1}{9}\sin(6t)+\frac{3}{64}\sin(8t)\right)dt$$

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$
$$\frac{19}{20}+\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{i\,e^{-16/s+s}\left(81+256\,e^{7/s}+1296\,e^{12/s}+20\,736\,e^{15/s}\right)}{27\,648\sqrt{\pi}\sqrt{s}}\,ds\quad\text{for }\gamma>0$$

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$

$$\frac{19}{20}+\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\left(\frac{3\,i\,\Gamma(s)}{4\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}+\frac{3\,i\,2^{-6-2s}\,\Gamma(s)}{\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}+\frac{i\,3^{-3-2s}\,\Gamma(s)}{4\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}+\frac{3\,i\,4^{-5-2s}\,\Gamma(s)}{\sqrt{\pi}\;\Gamma\left(\frac{1}{2}-s\right)}\right)ds$$

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

$$\left(1-2\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)\right)-\frac{47+3}{10^3}=$$

$$\frac{19}{20}+\int_{\frac{\pi}{2}}^{6}\left(\frac{\sin(t)}{54}+\frac{3\left(8-\frac{\pi}{2}\right)\sin\left(\frac{\pi-8t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)}{512\left(6-\frac{\pi}{2}\right)}+\frac{\left(2-\frac{\pi}{2}\right)\left(\frac{3}{2}\sin\left(\frac{-2\pi-2t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)+\frac{3\left(4-\frac{\pi}{2}\right)\sin\left(\frac{\pi-\frac{4\left(-2\pi-2t+\frac{\pi t}{2}\right)}{-6+\frac{\pi}{2}}+\frac{\pi\left(-2\pi-2t+\frac{\pi t}{2}\right)}{2\left(-6+\frac{\pi}{2}\right)}}{-2+\frac{\pi}{2}}\right)}{32\left(2-\frac{\pi}{2}\right)}\right)}{6-\frac{\pi}{2}}\right)dt$$

From:

The Kerr-Newman metric: A Review
Tim Adamo and E. T. Newman - arXiv:1410.6626v2 [gr-qc] 14 Nov 2016

Performing these transformations to (2.21), we recover the conventional Kerr-Schild form of the Kerr-Newman metric [15]:

$$ds^2 = dt^2 - dx^2 - dy^2 - dz^2 + \mathcal{F}\,(l_\mu dx^\mu)^2, \tag{3.15}$$

where

$$\mathcal{F} = -\frac{2Mr^3 - Q^2r^2}{r^4 + a^2z^2}$$

From:

$$\mathcal{F} = -\frac{2Mr^3 - Q^2r^2}{r^4 + a^2z^2}$$

where

$$z = r'\cos\theta' = r\cos\theta,$$

for M = 13.12806e+39, r = 1.94973e+13 and a = 5, Q = 6.19631e+26, we obtain:

-[(2*(13.12806e+39)*(1.94973e+13)^3) - (((((6.19631e+26)^2*(1.94973e+13)^2))))] /((((1.94973e+13)^4+5^2*(1.94973e+13*cos Pi)^2)))

Input interpretation:

$$-\frac{2\times 13.12806\times 10^{39}\,(1.94973\times 10^{13})^3 - (6.19631\times 10^{26})^2\,(1.94973\times 10^{13})^2}{(1.94973\times 10^{13})^4 + 5^2\,(1.94973\times 10^{13}\cos(\pi))^2}$$

Result:

$-3.366635648497075251756295248968922682835437001284729... \times 10^{26}$

$-3.366635648497... * 10^{26}$

From the above Ramanujan expression, we obtain:

10*((((cos(1-5)12 / (1-5)^4)) + ((cos (1+5)12 / (1+5)^4)) + ((cos (3-5)12 / (3-5)^4)) + ((cos(3+5)12 / (3+5)^4))))*10^26

Input:

$$10\left(\cos(1-5)\times\frac{12}{(1-5)^4}+\cos(1+5)\times\frac{12}{(1+5)^4}+\cos(3-5)\times\frac{12}{(3-5)^4}+\cos(3+5)\times\frac{12}{(3+5)^4}\right)\times 10^{26}$$

Exact result:

$$1\,000\,000\,000\,000\,000\,000\,000\,000\,000\left(\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}\right)$$

Decimal approximation:

$$-3.3428547615150425247720001214852963624164959414522 44\ldots\times 10^{26}$$

$-3.342854761515\ldots*10^{26}$

Property:

$$1\,000\,000\,000\,000\,000\,000\,000\,000\,000\left(\frac{3\cos(2)}{4}+\frac{3\cos(4)}{64}+\frac{\cos(6)}{108}+\frac{3\cos(8)}{1024}\right)$$
is a transcendental number

Alternate forms:

$$\frac{976\,562\,500\,000\,000\,000\,000\,000}{27}(20\,736\cos(2)+1296\cos(4)+256\cos(6)+81\cos(8))$$

$$\frac{750\,000\,000\,000\,000\,000\,000\,000\,000\cos(2)+46\,875\,000\,000\,000\,000\,000\,000\,000\cos(4)+250\,000\,000\,000\,000\,000\,000\,000\,000\cos(6)}{27}+2\,929\,687\,500\,000\,000\,000\,000\,000\cos(8)$$

$$\frac{15\,625\,000\,000\,000\,000\,000\,000\,000}{27}(1296\cos(2)+81\cos(4)+16\cos(6))+2\,929\,687\,500\,000\,000\,000\,000\,000\cos(8)$$

Alternative representations:

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26}=10\times 10^{26}\left(\frac{12\cosh(4\,i)}{(-4)^4}+\frac{12\cosh(2\,i)}{(-2)^4}+\frac{12\cosh(-6\,i)}{6^4}+\frac{12\cosh(-8\,i)}{8^4}\right)$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26} = 10\times 10^{26}\left(\frac{12\cosh(-4\,i)}{(-4)^4}+\frac{12\cosh(-2\,i)}{(-2)^4}+\frac{12\cosh(6\,i)}{6^4}+\frac{12\cosh(8\,i)}{8^4}\right)$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26} = 10\times 10^{26}\left(\frac{12}{(-4)^4\sec(-4)}+\frac{12}{(-2)^4\sec(-2)}+\frac{12}{6^4\sec(6)}+\frac{12}{8^4\sec(8)}\right)$$

Series representations:

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26} = \sum_{k=0}^{\infty}\frac{7\,450\,580\,596\,923\,828\,125\,(-1)^k\,2^{17+2k}\left(20\,736+81\times 4^{2+k}+256\times 9^k+81\times 16^k\right)}{27\,(2\,k)!}$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26} = \sum_{k=0}^{\infty}\frac{1}{27\,k!}976\,562\,500\,000\,000\,000\,000\,000\cos\left(\frac{k\,\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k+1296\,(4-z_0)^k+256\,(6-z_0)^k+81\,(8-z_0)^k\right)$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26} = \sum_{k=0}^{\infty}\left(\frac{750\,000\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(2-\frac{\pi}{2}\right)^{1+2k}}{(1+2\,k)!}+\frac{46\,875\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(4-\frac{\pi}{2}\right)^{1+2k}}{(1+2\,k)!}+\frac{250\,000\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(6-\frac{\pi}{2}\right)^{1+2k}}{27\,(1+2\,k)!}+\frac{2\,929\,687\,500\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(8-\frac{\pi}{2}\right)^{1+2k}}{(1+2\,k)!}\right)$$

Integral representations:

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26}=$$
$$\frac{21\,844\,726\,562\,500\,000\,000\,000\,000\,000}{27}+$$
$$\int_0^1\left(-1\,500\,000\,000\,000\,000\,000\,000\,000\,000\sin(2\,t)-\right.$$
$$187\,500\,000\,000\,000\,000\,000\,000\,000\sin(4\,t)-\frac{500\,000\,000\,000\,000\,000\,000\,000\,000}{9}\sin(6\,t)-$$
$$\left.23\,437\,500\,000\,000\,000\,000\,000\,000\sin(8\,t)\right)dt$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26}=$$
$$\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}-\frac{1}{27\sqrt{\pi}\,\sqrt{s}}\,488\,281\,250\,000\,000\,000\,000\,000\,i\,e^{-16/s+s}$$
$$\left(81+256\,e^{7/s}+1296\,e^{12/s}+20\,736\,e^{15/s}\right)ds\quad\text{for }\gamma>0$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26}=$$
$$\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\left(-\frac{375\,000\,000\,000\,000\,000\,000\,000\,000\,i\,\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{1}{2}-s\right)}-\right.$$
$$\frac{22\,351\,741\,790\,771\,484\,375\,i\,2^{20-2\,s}\,\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{1}{2}-s\right)}-$$
$$\frac{125\,000\,000\,000\,000\,000\,000\,000\,000\,i\,3^{-3-2\,s}\,\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{1}{2}-s\right)}-$$
$$\left.\frac{22\,351\,741\,790\,771\,484\,375\,i\,4^{8-2\,s}\,\Gamma(s)}{\sqrt{\pi}\,\Gamma\left(\frac{1}{2}-s\right)}\right)ds\quad\text{for }0<\gamma<\frac{1}{2}$$

$$10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{26}=$$

$$\int_{\frac{\pi}{2}}^{6}\left(-\frac{250\,000\,000\,000\,000\,000\,000\,000\,000\,\sin(t)}{27}-\frac{2\,929\,687\,500\,000\,000\,000\,000\,000\left(8-\frac{\pi}{2}\right)\sin\left(\frac{\pi-8t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)}{6-\frac{\pi}{2}}+\frac{1}{6-\frac{\pi}{2}}\left(2-\frac{\pi}{2}\right)\left(-750\,000\,000\,000\,000\,000\,000\,000\,000\sin\left(\frac{-2\pi-2t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)-\frac{1}{2-\frac{\pi}{2}}46\,875\,000\,000\,000\,000\,000\,000\,000\left(4-\frac{\pi}{2}\right)\sin\left(\frac{\pi-\frac{4\left(-2\pi-2t+\frac{\pi t}{2}\right)}{-6+\frac{\pi}{2}}+\frac{\pi\left(-2\pi-2t+\frac{\pi t}{2}\right)}{2\left(-6+\frac{\pi}{2}\right)}}{-2+\frac{\pi}{2}}\right)\right)\right)dt$$

Furthermore, we have:

((-(((-[(2*(13.12806e+39)*(1.94973e+13)^3) - (((((6.19631e+26)^2*(1.94973e+13)^2))))] /(((((1.94973e+13)^4+5^2*(1.94973e+13*cos Pi)^2))))))))^1/128

Input interpretation:

$$\sqrt[128]{-\left(-\frac{2\times 13.12806\times 10^{39}\,(1.94973\times 10^{13})^3-(6.19631\times 10^{26})^2\,(1.94973\times 10^{13})^2}{(1.94973\times 10^{13})^4+5^2\,(1.94973\times 10^{13}\,\cos(\pi))^2}\right)}$$

Result:

1.611549759465082587507749415700751376621563703331470421384...

1.6115497594… result that is near to the value of the golden ratio 1,618033988749...

log base 1.611549759465((-(((-[(2*(13.12806e+39)*(1.94973e+13)^3) - (((((6.19631e+26)^2*(1.94973e+13)^2))))] /((((1.94973e+13)^4+5^2*(1.94973e+13*cos Pi)^2))))))))-Pi+1/golden ratio

Input interpretation:

$$\log_{1.611549759465}\left(-\left(-\frac{2\times 13.12806\times 10^{39}\,(1.94973\times 10^{13})^3-(6.19631\times 10^{26})^2\,(1.94973\times 10^{13})^2}{(1.94973\times 10^{13})^4+5^2\,(1.94973\times 10^{13}\cos(\pi))^2}\right)\right)-\pi+\frac{1}{\phi}$$

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

ϕ is the golden ratio

Result:

125.476...

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

log base 1.611549759465((-(((-[(2*(13.12806e+39)*(1.94973e+13)^3) - (((((6.19631e+26)^2*(1.94973e+13)^2))))] /((((1.94973e+13)^4+5^2*(1.94973e+13*cos Pi)^2))))))))+11+1/golden ratio

Input interpretation:

$$\log_{1.611549759465}\left(-\left(-\frac{2\times 13.12806\times 10^{39}\,(1.94973\times 10^{13})^3-(6.19631\times 10^{26})^2\,(1.94973\times 10^{13})^2}{(1.94973\times 10^{13})^4+5^2\,(1.94973\times 10^{13}\cos(\pi))^2}\right)\right)+11+\frac{1}{\phi}$$

$\log_b(x)$ 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

From:

$$E = M - \frac{Q^2}{R}\left(\frac{a^2}{3R^2} + \frac{1}{2}\right).$$

for M = 13.12806e+39, r = 1.94973e+13 and a = 5, Q = 6.19631e+26, we obtain:

((((13.12806e+39) –
((((6.19631e+26)^2)/(1.94973e+13)))*(((((((5^2)/((3*1.94973e+13)^2)))+1/2)))))))

Input interpretation:

$$13.12806\times 10^{39} - \frac{(6.19631\times 10^{26})^2}{1.94973\times 10^{13}}\left(\frac{5^2}{(3\times 1.94973\times 10^{13})^2} + \frac{1}{2}\right)$$

Result:

$3.2820152614721012653034008398327250918984767834490940... \times 10^{39}$

3.28201526...*10^{39}

From the previous Ramanujan expression, we obtain:

(((-(55+5)/10^3))*10^39 -10*((((cos(1-5)12 / (1-5)^4)) + ((cos (1+5)12 / (1+5)^4)) + ((cos (3-5)12 / (3-5)^4)) + ((cos(3+5)12 / (3+5)^4))))*10^39)

Input:

$$-\frac{55+5}{10^3}\times 10^{39} - 10\left(\cos(1-5)\times\frac{12}{(1-5)^4} + \cos(1+5)\times\frac{12}{(1+5)^4} + \cos(3-5)\times\frac{12}{(3-5)^4} + \cos(3+5)\times\frac{12}{(3+5)^4}\right)\times 10^{39}$$

Exact result:

$$-60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 - 10\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\left(\frac{3\cos(2)}{4} + \frac{3\cos(4)}{64} + \frac{\cos(6)}{108} + \frac{3\cos(8)}{1024}\right)$$

Decimal approximation:

$3.2828547615150425247720001214852963624164959414522445... \times 10^{39}$

3.28285476…*10^{39}

Property:

$$-60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 - 10\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 \left(\frac{3\cos(2)}{4} + \frac{3\cos(4)}{64} + \frac{\cos(6)}{108} + \frac{3\cos(8)}{1024}\right) \text{ is a transcendental number}$$

Alternate forms:

$$-\frac{78\,125\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}{27} (20\,736 + 2\,592\,000\cos(2) + 162\,000\cos(4) + 32\,000\cos(6) + 10\,125\cos(8))$$

$$-\frac{1\,250\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}{27} (1296 + 162\,000\cos(2) + 10\,125\cos(4) + 2000\cos(6)) - 29\,296\,875\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\cos(8)$$

$$-60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 - 7\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\cos(2) - 468\,750\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\cos(4) - \frac{2\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\cos(6)}{27} - 29\,296\,875\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\cos(8)$$

Alternative representations:

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} = -10\times 10^{39}\left(\frac{12\cosh(4\,i)}{(-4)^4} + \frac{12\cosh(2\,i)}{(-2)^4} + \frac{12\cosh(-6\,i)}{6^4} + \frac{12\cosh(-8\,i)}{8^4}\right) - \frac{60\times 10^{39}}{10^3}$$

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} = -10\times 10^{39}\left(\frac{12\cosh(-4\,i)}{(-4)^4} + \frac{12\cosh(-2\,i)}{(-2)^4} + \frac{12\cosh(6\,i)}{6^4} + \frac{12\cosh(8\,i)}{8^4}\right) - \frac{60\times 10^{39}}{10^3}$$

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} = -\frac{60\times 10^{39}}{10^3} - 10\times 10^{39}\left(\frac{12}{(-4)^4\sec(-4)} + \frac{12}{(-2)^4\sec(-2)} + \frac{12}{6^4\sec(6)} + \frac{12}{8^4\sec(8)}\right)$$

Series representations:

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} = -60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 + \sum_{k=0}^{\infty} -\frac{1}{27\,(2k)!}\,9\,094\,947\,017\,729\,282\,379\,150\,390\,625\,(-1)^k\,4^{15+k}\left(20\,736 + 81\times 4^{2+k} + 256\times 9^k + 81\times 16^k\right)$$

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} = -60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 + \sum_{k=0}^{\infty} -\frac{1}{27\,k!}\,9\,765\,625\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\cos\left(\frac{k\pi}{2}+z_0\right)\left(20\,736\,(2-z_0)^k + 1296\,(4-z_0)^k + 256\,(6-z_0)^k + 81\,(8-z_0)^k\right)$$

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} = -60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 + \sum_{k=0}^{\infty}\left(-\frac{1}{(1+2k)!}\,7500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(2-\frac{\pi}{2}\right)^{1+2k} - \frac{468\,750\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(4-\frac{\pi}{2}\right)^{1+2k}}{(1+2k)!} - \frac{2\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(6-\frac{\pi}{2}\right)^{1+2k}}{27\,(1+2k)!} - \frac{29\,296\,875\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,(-1)^{-1+k}\left(8-\frac{\pi}{2}\right)^{1+2k}}{(1+2k)!}\right)$$

Integral representations:

$$\frac{10^{39}(-(55+5))}{10^3}-10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39}=$$
$$-60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000+\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{1}{\sqrt{\pi}\,\Gamma\left(\frac{1}{2}-s\right)}\,9\,094\,947\,017\,729\,282\,379\,150\,390\,625\,i\,2^{29-4s}\times 3^{-3-2s}\left(9^{2+s}+16^{2+s}+36^{2+s}+144^{2+s}\right)\Gamma(s)\,ds \quad \text{for } 0<\gamma<\frac{1}{2}$$

$$\frac{10^{39}(-(55+5))}{10^3}-10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39}=$$
$$-\frac{220\,067\,265\,625\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}{27}+\int_0^1\frac{78\,125\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}{9}\left(1728\sin(2t)+216\sin(4t)+64\sin(6t)+27\sin(8t)\right)dt$$

$$\frac{10^{39}(-(55+5))}{10^3}-10\left(\frac{\cos(1-5)\,12}{(1-5)^4}+\frac{\cos(1+5)\,12}{(1+5)^4}+\frac{\cos(3-5)\,12}{(3-5)^4}+\frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39}=$$
$$-60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000+\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{1}{27\sqrt{\pi}\,\sqrt{s}}\,4\,882\,812\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,i\,e^{-16/s+s}\left(81+256\,e^{7/s}+1296\,e^{12/s}+20\,736\,e^{15/s}\right)ds \quad \text{for } \gamma>0$$

$$\frac{10^{39}(-(55+5))}{10^3} - 10\left(\frac{\cos(1-5)\,12}{(1-5)^4} + \frac{\cos(1+5)\,12}{(1+5)^4} + \frac{\cos(3-5)\,12}{(3-5)^4} + \frac{\cos(3+5)\,12}{(3+5)^4}\right)10^{39} =$$

$$-60\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000 + \int_{\frac{\pi}{2}}^{6}\left(\frac{2\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\sin(t)}{27} + \frac{29\,296\,875\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\left(8-\frac{\pi}{2}\right)\sin\left(\frac{\pi-8t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right)}{6-\frac{\pi}{2}} + \frac{1}{6-\frac{\pi}{2}}\left(2-\frac{\pi}{2}\right)\left(7\,500\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\sin\left(\frac{-2\pi-2t+\frac{\pi t}{2}}{-6+\frac{\pi}{2}}\right) + \frac{1}{2-\frac{\pi}{2}}\,468\,750\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\left(4-\frac{\pi}{2}\right)\sin\left(\frac{\pi - \frac{4\left(-2\pi-2t+\frac{\pi t}{2}\right)}{-6+\frac{\pi}{2}} + \frac{\pi\left(-2\pi-2t+\frac{\pi t}{2}\right)}{2\left(-6+\frac{\pi}{2}\right)}}{-2+\frac{\pi}{2}}\right)\right)\right)dt$$

Furthermore, we have also:

((((13.12806e+39) – ((((6.19631e+26)^2)/(1.94973e+13)))*((((((((5^2)/((3*1.94973e+13)^2)))+1/2)))))))^1/(199-7-3)

Input interpretation:

$$\sqrt[199-7-3]{13.12806\times10^{39} - \frac{(6.19631\times10^{26})^2}{1.94973\times10^{13}}\left(\frac{5^2}{(3\times1.94973\times10^{13})^2}+\frac{1}{2}\right)}$$

Result:

1.618378532544040747771160033787757875726696470590646925406 16...

1.6183785325… result that is a very good approximation to the value of the golden ratio 1,618033988749...

1/10^27*((((((((13.12806e+39) – ((((6.19631e+26)^2)/(1.94973e+13)))*(((((((5^2)/((3*1.94973e+13)^2)))+1/2))))))))^1/(199-7-3) + (47+7)/10^3))))

Input interpretation:

$$\frac{1}{10^{27}}\left(\sqrt[199-7-3]{13.12806\times 10^{39}-\frac{(6.19631\times 10^{26})^2}{1.94973\times 10^{13}}\left(\frac{5^2}{(3\times 1.94973\times 10^{13})^2}+\frac{1}{2}\right)}+\frac{47+7}{10^3}\right)$$

Result:

$1.672379... \times 10^{-27}$

$1.672379...*10^{-27}$ result practically equal to the proton mass

From

The Ekpyrotic Universe: Colliding Branes and the Origin of the Hot Big Bang
Justin Khoury, Burt A. Ovrut, Paul J. Steinhardt and Neil Turok – arXiv:hep-th/0103239v3 15 Aug 2001

We have that:

As a specific fully-worked example, consider the case of an exponential bulk brane potential, $V(Y) = -v\exp(-m\alpha Y)$, as discussed in Section V B 2. We have computed the ekpyrotic temperature at the beginning of the hot big bang phase (Eq. (30)),

$$\frac{T}{M_{pl}} \approx \frac{3^{3/4}(2v)^{1/4}}{(I_3 M_5)^{1/2}(\alpha R + C)^{1/4}}\left(\frac{M_5}{M_{pl}}\right)^{1/2}\left(\frac{\beta}{\alpha}\right)^{1/2}\frac{(mC+2)^{1/2}}{m}. \quad (91)$$

$$\frac{T}{M_{pl}} \approx \frac{3^{3/4}(2v)^{1/4}}{(I_3 M_5)^{1/2}(\alpha R + C)^{1/4}} \left(\frac{M_5}{M_{pl}}\right)^{1/2} \left(\frac{\beta}{\alpha}\right)^{1/2} \frac{(mC+2)^{1/2}}{m}.$$

For

m_P (Planck mass)

$$\sqrt{\frac{c\,\hbar}{G}}$$

(G: Newtonian gravitational constant; $\hbar$: reduced Planck constant; c: speed of light)

21.764 µg (micrograms)

0.021764 mg (milligrams)

2.1764×10^{-5} grams

2.1764×10^{-8} kg (kilograms)

$$v = 10^{-8}$$

where we have used Eq. (16). As an example, we might suppose $\alpha = 2000 M_5$, $\beta = M_5$, $B = 10^{-4}$, $C = 1000$, $R = M_5^{-1}$, $v \sim 10^{-8}$, and $m = 0.1$, all plausible values. This gives $M_5 = 10^{-2} M_{pl}$ and produces an ekpyrotic temperature of 10^{11} GeV. Note that, with these parameters, the magnitude of the potential energy density for Y is $(10^{-6} M_{pl})^4$ at collision.

3^(3/4)(2*1*10^-8)^0.25 / (((((((((x*10^(-2)*(2.1764e-8))))^1/2 * ((((2000*10^(-2)*(2.1764e-8)*1/((10^(-2)*(2.1764e-8)))+1000))))^0.25)))))) * (10^-2)^1/2 * (1/2000)^1/2 * (0.1*1000+2)^1/2*1/(0.1)

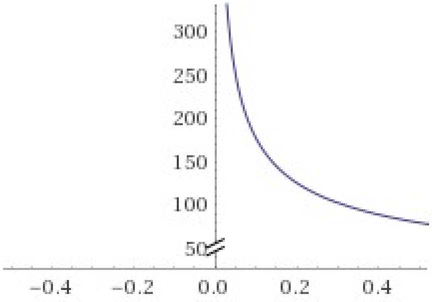
Input interpretation:

$$3^{3/4} \times \frac{(2 \times 1 \times 10^{-8})^{0.25}}{\sqrt{\frac{x \times 2.1764 \times 10^{-8}}{10^2}} \left(2000 \times 10^{-2} \times 2.1764 \times 10^{-8} \times \frac{1}{\frac{2.1764 \times 10^{-8}}{10^2}} + 1000\right)^{0.25}} \sqrt{\frac{1}{10^2}} \sqrt{\frac{1}{2000}} \sqrt{0.1 \times 1000 + 2} \times \frac{1}{0.1}$$

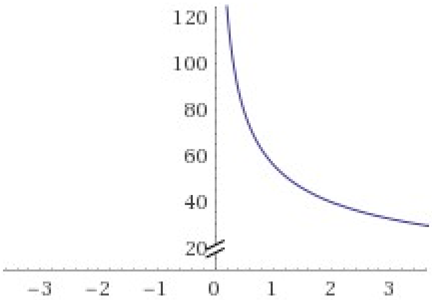
Result:

$$\frac{56.0704}{\sqrt{x}}$$

Plots:



(x from −0.5 to 0.5)



(x from −3.6 to 3.6)

Roots:

(no roots exist)

Properties as a real function:

Domain

$\{x \in \mathbb{R} : x > 0\}$ (all positive real numbers)

Range

$\{y \in \mathbb{R} : y > 0\}$ (all positive real numbers)

Injectivity

injective (one-to-one)

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

Derivative:

$$\frac{d}{dx}\left(\frac{56.0704}{\sqrt{x}}\right) = -\frac{28.0352}{x^{3/2}}$$

Indefinite integral:

$$\int \frac{3^{3/4}\,(2\,1 \times 10^{-8})^{0.25}\sqrt{\frac{1}{10^2}}\sqrt{\frac{1}{2000}}\sqrt{0.1 \times 1000 + 2}}{\left(\sqrt{\frac{x\,2.1764 \times 10^{-8}}{10^2}}\left(\frac{2000 \times 10^{-2}\,2.1764 \times 10^{-8}}{\frac{2.1764 \times 10^{-8}}{10^2}} + 1000\right)^{0.25}\right)0.1}\,dx =$$

$$112.141\sqrt{x} + \text{constant}$$

Limit:

$$\lim_{x \to \pm\infty} \frac{56.0704}{\sqrt{x}} = 0 \approx 0$$

Definite integral after subtraction of diverging parts:

$$\int_0^\infty \left(\frac{56.0704}{\sqrt{x}} - \frac{56.0704}{\sqrt{x}}\right) dx = 0$$

We have $x = I_3$ from -3.6 to 3.6

Now, we have the following Ramanujan mock theta function:

$$F(q)=1+\frac{q^2}{1-q}+\frac{q^8}{(1-q)(1-q^3)}+\dots,$$
$$\phi(-q)+\chi(q)=2F(q),$$

1+(0.449329^2)/(1-0.449329) + (0.449329)^8 / ((1-0.449329)(1-0.449329^3))

Input interpretation:

$$1+\frac{0.449329^2}{1-0.449329}+\frac{0.449329^8}{(1-0.449329)(1-0.449329^3)}$$

Result:

1.369955709042580254965844050909072881396600348644448209935...

F(q) = 1.369955709...

And:

Input interpretation:

$$2\left(1+\frac{0.449329^2}{1-0.449329}+\frac{0.449329^8}{(1-0.449329)(1-0.449329^3)}\right)$$

Result:

2.739911418085160509931688101818145762793200697288896419870...

2F(q) = 2.73991141808516...

$$\psi(q)-F(q^2)+1=q\frac{1+q^2+q^6+q^{12}+\dots}{(1-q^8)(1-q^{12})(1-q^{28})\dots}$$

0.449329(((((1+0.449329^2 + 0.449329^6 + 0.449329^12) / ((1-0.449329^8)(1-0.449329^12)(1-0.449329^28)))

Input interpretation:

$$0.449329\times\frac{1+0.449329^2+0.449329^6+0.449329^{12}}{(1-0.449329^8)(1-0.449329^{12})(1-0.449329^{28})}$$

Result:

0.54471718454323918947064094732782784686803094215642571769 5...

$\psi(q)-F(q^2)+1$ = 0.54471718545239...

From the sum of the two values, we obtain:

2.73991141808516+0.54471718545239

2.73991141808516 + 0.54471718545239

3.28462860353755

3.2846286....

For I_3 = 3.2846286… we obtain:

3^(3/4)(2*1*10^-8)^0.25 / (((((((3.2846286)*10^(-2)*(2.1764e-8))))^1/2 * ((((2000*10^(-2)*(2.1764e-8)*1/((10^(-2)*(2.1764e-8)))+1000))))^0.25))) * (10^-2)^1/2 * (1/2000)^1/2 * (0.1*1000+2)^1/2*1/(0.1)

Input interpretation:

$$3^{3/4}\times\frac{(2\times1\times10^{-8})^{0.25}}{\sqrt{\frac{3.2846286\times2.1764\times10^{-8}}{10^2}}\left(2000\times10^{-2}\times2.1764\times10^{-8}\times\frac{1}{\frac{2.1764\times10^{-8}}{10^2}}+1000\right)^{0.25}}$$
$$\sqrt{\frac{1}{10^2}}\sqrt{\frac{1}{2000}}\sqrt{0.1\times1000+2}\times\frac{1}{0.1}$$

Result:

30.9379...

30.9379

With the reduced Planck mass 4.341×10^{-9} kg, we obtain:

3^(3/4)(2*1*10^-8)^0.25 / (((((((3.2846286)*10^(-2)*(4.341e-9))))^1/2 * ((((2000*10^(-2)*(4.341e-9)*1/((10^(-2)*(4.341e-9)))+1000))))^0.25))) * (10^-2)^1/2 * (1/2000)^1/2 * (0.1*1000+2)^1/2*1/(0.1)

Input interpretation:

$$3^{3/4}\times\frac{(2\times1\times10^{-8})^{0.25}}{\sqrt{\frac{3.2846286\times4.341\times10^{-9}}{10^2}}\left(2000\times10^{-2}\times4.341\times10^{-9}\times\frac{1}{\frac{4.341\times10^{-9}}{10^2}}+1000\right)^{0.25}}$$
$$\sqrt{\frac{1}{10^2}}\sqrt{\frac{1}{2000}}\sqrt{0.1\times1000+2}\times\frac{1}{0.1}$$

Result:

69.27318987336616063679794111632654166027862826463295489868...

69.27318987336616.....

From which:

$$\frac{T}{M_{pl}}\approx\frac{3^{3/4}(2v)^{1/4}}{(I_3M_5)^{1/2}(\alpha R+C)^{1/4}}\left(\frac{M_5}{M_{pl}}\right)^{1/2}\left(\frac{\beta}{\alpha}\right)^{1/2}\frac{(mC+2)^{1/2}}{m}.$$

T = 30.9379 * 2.1764e-8

$30.9379\times2.1764\times10^{-8}$

6.733324556×10^{-7}

Input interpretation:

$6.733324556\times10^{-7}=67.33324556\times10^{-8}$

67.33324556 * 10^{-8}

6.733324556 × 10^-7 Kg = GeV

Input interpretation:

convert 6.733324556×10^{-7} kg (kilograms)
to gigaelectronvolts per speed of light squared

Result:

3.77711807×10^{20} GeV/c^2

Input interpretation:

convert 3.77711807×10^{20} GeV/c^2 to electronvolts per speed of light squared

Result:

3.77711807×10^{29} eV/c^2

Input interpretation:

convert $3.77711807 \times 10^{29}$ eV/k_B (electronvolts per Boltzmann constant) to kelvins

Result:

4.3831635×10^{33} K (kelvins)

Additional conversions:

4.3831635×10^{33} °C (degrees Celsius)

4.3831635 * 10^{33}

Or:

T = 69.27318987336616 * 4.341e-9

Input interpretation:

$69.27318987336616 \times 4.341 \times 10^{-9}$

Result:

$3.0071491724028250056 \times 10^{-7}$

Input interpretation:

$3.0071491724028250056 \times 10^{-7} = 30.071491724028250056 \times 10^{-8}$

30.071491724...*10^{-8}

Input interpretation:

convert $30.071491724 \times 10^{-8}$ kg (kilograms)
to electronvolts per speed of light squared

Result:

$1.686886973 \times 10^{29}$ eV/c^2

Input interpretation:

convert $1.686886973 \times 10^{29}$ eV/k_B (electronvolts per Boltzmann constant) to kelvins

Result:

$1.95755104 \times 10^{33}$ K (kelvins)

Additional conversions:

$1.95755104 \times 10^{33}$ °C (degrees Celsius)

$1.95755104 * 10^{33}$

Now, we have that:

In terms of this temperature, the scalar (energy density) fluctuation amplitude in Eq. (75) can be rewritten as

$$|\delta_k| = \frac{m^6 (I_3 \alpha)^{3/2}}{36\pi^{3/2}(mC+2)^2} \left(\frac{\alpha}{\beta}\right)^{3/2} \frac{2}{mD_k} \left(\frac{T}{M_{pl}}\right)^2 . \quad (92)$$

From

$$|\delta_k| = \frac{m^6 (I_3 \alpha)^{3/2}}{36\pi^{3/2}(mC+2)^2} \left(\frac{\alpha}{\beta}\right)^{3/2} \frac{2}{mD_k} \left(\frac{T}{M_{pl}}\right)^2 .$$

A simple example which satisfies all constraints is $\alpha = 2000M_5$, $\beta = M_5$, $B = 10^{-4}$, $C = 1000$, $R = M_5{}^1$, $m = 0.1$, and $v = 10^{-8}$, all of which are plausible values. In this example, D_k (the value of D at horizon crossing) is of order 10^3. Then, we find that $M_5 \sim 10^{-2} M_{pl}$; the ekpyrotic temperature is $T \sim 10^{-8} M_{pl}$; and the scalar perturbation amplitude is $|\delta_k| \sim 10^{-5}$. Note that the ekpyrotic temperature, the maximal temperature

$I_3 = 3.2846286\ldots$

$T = 4.3831635 * 10^{33}$

(0.1^6(((3.2846286*((2000*10^(-2)*(2.1764e-8))))^(1.5))))/(((36Pi^(1.5)(0.1*1000+2)^2))) * (2000)^1.5 * 2/(0.1*1*10^3)*(((4.3831635e+33)/(2.1764e-8)))^2

Input interpretation:

$$\frac{0.1^6\left(3.2846286\left(2000\times 10^{-2}\times 2.1764\times 10^{-8}\right)\right)^{1.5}}{36\,\pi^{1.5}\,(0.1\times 1000+2)^2}\times 2000^{1.5}\times\frac{2}{0.1\times 1\times 10^3}\left(\frac{4.3831635\times 10^{33}}{2.1764\times 10^{-8}}\right)^2$$

Result:

$5.947407794239954635756069299916649567743226651932212 7\ldots\times 10^{64}$

$|\delta_k| = 5.94740779423995\ldots * 10^{64}$

Or, for $67.33324556 * 10^{-8}$ Kg, we obtain:

(0.1^6(((3.2846286*((2000*10^(-2)*(2.1764e-8))))^(1.5))))/(((36Pi^(1.5)(0.1*1000+2)^2))) * (2000)^1.5 * 2/(0.1*1*10^3)*(((67.33324556e-8)/(2.1764e-8)))^2

Input interpretation:

$$\frac{0.1^6\left(3.2846286\left(2000\times 10^{-2}\times 2.1764\times 10^{-8}\right)\right)^{1.5}}{36\,\pi^{1.5}\,(0.1\times 1000+2)^2}\times 2000^{1.5}\times\frac{2}{0.1\times 1\times 10^3}\left(\frac{67.33324556\times 10^{-8}}{2.1764\times 10^{-8}}\right)^2$$

Result:

$1.4034969493732081613564234153025926690144678816808813\ldots\times 10^{-15}$

$1.403496949\ldots * 10^{-15}$

From which, performing the 3th root:

(((((0.1^6(((3.2846286*((2000*10^(-2)*(2.1764e-8))))^(1.5))))/(((36Pi^(1.5)(0.1*1000+2)^2))) * (2000)^1.5 * 2/(0.1*1*10^3)*(((67.33324556e-8)/(2.1764e-8)))^2))))^1/3

Input interpretation:

$$\left(\frac{0.1^6\left(3.2846286\left(2000\times 10^{-2}\times 2.1764\times 10^{-8}\right)\right)^{1.5}}{36\,\pi^{1.5}\,(0.1\times 1000+2)^2}\times 2000^{1.5}\times\frac{2}{0.1\times 1\times 10^3}\left(\frac{67.33324556\times 10^{-8}}{2.1764\times 10^{-8}}\right)^2\right)^\wedge(1/3)$$

Result:

$0.000011196195958789708807616751141043004584009173870062240\ldots$

$1.1196195958789708807616751141043004584009173870 0\times 10^{-5}$

$|\delta_k| = 1.11961959587897\ldots*10^{-5}$

Or:

$11.19619595878970880761675114104300458400917387 00\times 10^{-6}$

$11.1961959587897088...*10^{-6}$

Now, dividing the temperature by the result of 3th root of the energy density and multiplying by m = 0.1 , we obtain:

0.1*1/(67.33324556e-8 / 11.1961959587897e-6)

Input interpretation:

$$0.1\times\frac{1}{\frac{67.33324556\times 10^{-8}}{11.1961959587897\times 10^{-6}}}$$

Result:

1.662803547589708669911321589352479744034486134459846168151...

1.662803547589... result very near to the 14th root of the following Ramanujan's class invariant $Q = \left(G_{505}/G_{101/5}\right)^3$ = 1164,2696 i.e. 1,65578...

From which:

0.1*1/(67.33324556e-8 / 11.1961959587897e-6) - (47-2)*1/10^3

Input interpretation:

$$0.1\times\frac{1}{\frac{67.33324556\times 10^{-8}}{11.1961959587897\times 10^{-6}}}-(47-2)\times\frac{1}{10^3}$$

Result:

1.617803547589708669911321589352479744034486134459846168151...

1.6178035475897.... result that is a very good approximation to the value of the golden ratio 1,618033988749...

And:

1/(((0.1*1/(67.33324556e-8 / 11.1961959587897e-6) - (47-2)*1/10^3)))

Input interpretation:

$$\frac{1}{0.1 \times \frac{1}{\frac{67.33324556 \times 10^{-8}}{11.1961959587897 \times 10^{-6}}} - (47-2) \times \frac{1}{10^3}}$$

Result:

0.61812202197841273775882847301017798190092589872650919760 3...

0.618122021978412.... result practically equal to the golden ratio conjugate 0.61803398...

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:

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

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*

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