On some Ramanujan formulas: mathematical connections with ϕ and several parameters of Quantum Geometry of Space, String Theory and Particle Physics (f_0(1710) scalar meson)

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Abstract

In this paper we have described and analyzed some Ramanujan expressions. We have obtained several mathematical connections with ϕ and various parameters of Quantum Geometry of Space, String Theory and Particle Physics.

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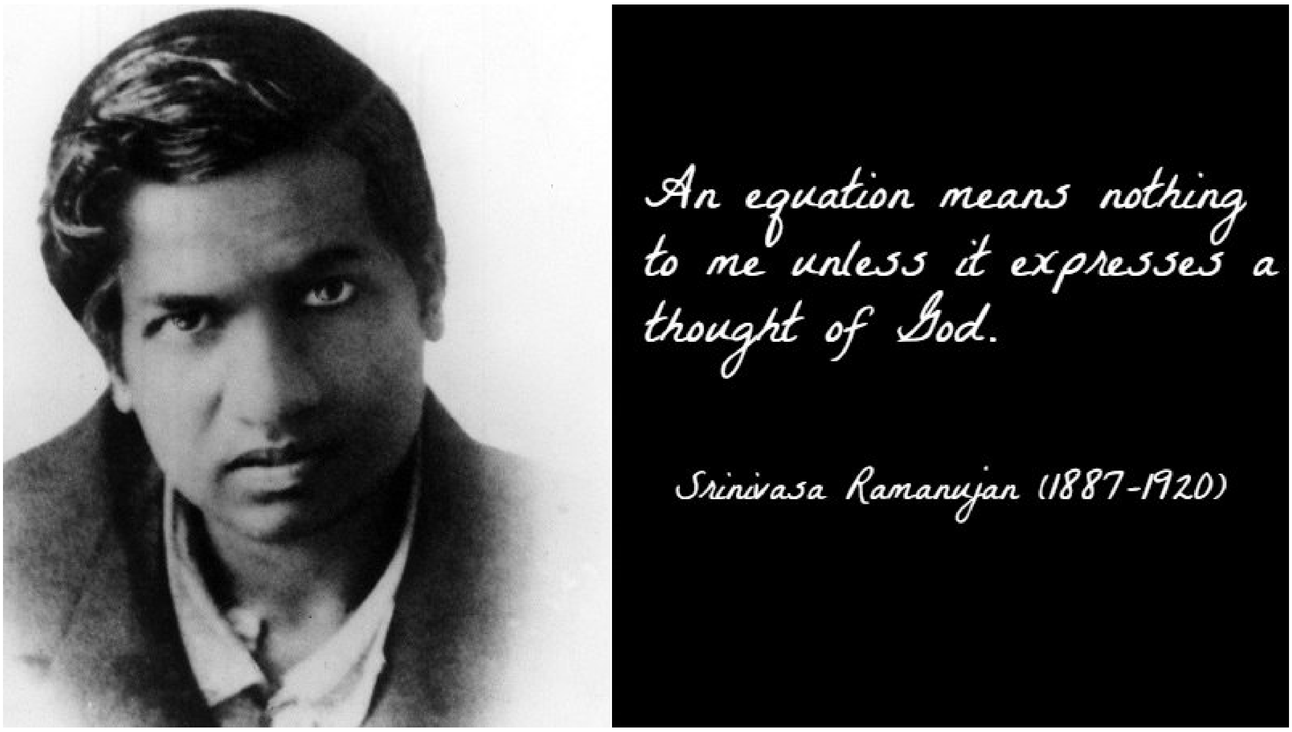


https://mobygeek.com/features/indian-mathematician-srinivasa-ramanujan-quotes-11012

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

From

On Climbing Scalars in String Theory
E. Dudas, N. Kitazawa and A. Sagnotti - arXiv:1009.0874v1 [hep-th] 4 Sep 2010

We have that:

$$\beta = \sqrt{\frac{D-1}{D-2}}\,, \qquad \tau = M\,\beta\,t\,, \qquad \varphi = \frac{\beta\,\phi}{\sqrt{2}}\,, \qquad a = (D-1)\,A\,,$$

$$\gamma = \frac{D+2}{\sqrt{2\,(D-1)\,(D-2)}}\,,$$

$\gamma > 1$ for $D \le 4$ and $\gamma < 1$ for $D \ge 5$.

(4+2)/sqrt(2(4-1)(4-2))

Input:

$$\frac{4+2}{\sqrt{2\,(4-1)\,(4-2)}}$$

Result:

$$\sqrt{3}$$

Decimal approximation:

1.7320508075688772935274463415058723669428052538103806280558...

$\gamma = \sqrt{3}$

sqrt((4-1)/(4-2))

Input:

$$\sqrt{\frac{4-1}{4-2}}$$

Result:

$$\sqrt{\frac{3}{2}}$$

Decimal approximation:

1.2247448713915890490986420373529456959829737403283350642163...

1.2247448713…

Alternate form:

$$\frac{\sqrt{6}}{2}$$

β = (√3/2)

x*(sqrt(3/2))/(sqrt2) = y

Input:

$$x \times \frac{\sqrt{\frac{3}{2}}}{\sqrt{2}} = y$$

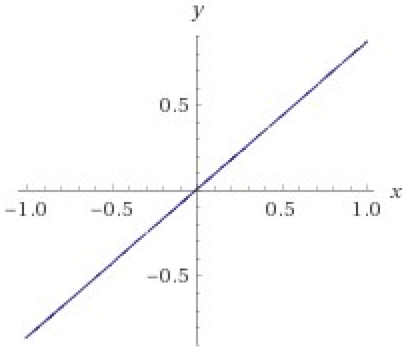
Exact result:

$$\frac{\sqrt{3}\,x}{2} = y$$

Geometric figure:

line

Implicit plot:



Alternate forms:

$$x = \frac{2\,y}{\sqrt{3}}$$

$$\frac{\sqrt{3}\,x}{2} - y = 0$$

Real solution:

$$y = \frac{\sqrt{3}\,x}{2}$$

Solution:

$$y = \frac{\sqrt{3}\ x}{2}$$

Integer solution:

$x = 0\ ,\quad y = 0$

Partial derivatives:

$$\frac{\partial}{\partial x}\left(\frac{\sqrt{3}\ x}{2}\right) = \frac{\sqrt{3}}{2}$$

$$\frac{\partial}{\partial y}\left(\frac{\sqrt{3}\ x}{2}\right) = 0$$

(sqrt(3/2))/(sqrt2) = (sqrt3)/2

Input:

$$\frac{\sqrt{\frac{3}{2}}}{\sqrt{2}} = \frac{\sqrt{3}}{2}$$

Result:

True

φ = √3 / 2

From:

$$e^{\varphi} = e^{\varphi_0} \left[\sin\left(\frac{\tau}{2}\sqrt{\gamma^2 - 1}\right)\right]^{\frac{1}{1+\gamma}} \left[\cos\left(\frac{\tau}{2}\sqrt{\gamma^2 - 1}\right)\right]^{\frac{1}{\gamma-1}}\ , \qquad (2.15)$$

we obtain:

exp((sqrt3)/2) = x* ((([sin (5/2*sqrt(3-1))])))^(1/(1+sqrt3)) * ((([cos(5/2*sqrt(3-1))])))^(1/(sqrt3-1))

Input:

$$\exp\left(\frac{\sqrt{3}}{2}\right) = x\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{2}\sqrt{3-1}\right)}$$

Exact result:

$$e^{\sqrt{3}/2} = x\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{\sqrt{2}}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{\sqrt{2}}\right)}$$

Alternate forms:

$$e^{\sqrt{3}/2} = x\sin^{1/2(\sqrt{3}-1)}\left(\frac{5}{\sqrt{2}}\right)\cos^{1/2(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)$$

$$e^{\sqrt{3}/2} = 2^{-1/(\sqrt{3}-1)-1/(1+\sqrt{3})}\sqrt[1+\sqrt{3}]{i\left(e^{-(5i)/\sqrt{2}} - e^{(5i)/\sqrt{2}}\right)}\sqrt[\sqrt{3}-1]{e^{-(5i)/\sqrt{2}} + e^{(5i)/\sqrt{2}}}\,x$$

Alternate form assuming x is real:

$$e^{\sqrt{3}/2} = x\sqrt[1+\sqrt{3}]{-\sin\left(\frac{5}{\sqrt{2}}\right)}\sin\left(\frac{\pi}{\sqrt{3}-1}\right)\sin\left(\frac{\pi}{1+\sqrt{3}}\right)\left(-\sqrt[\sqrt{3}-1]{-\cos\left(\frac{5}{\sqrt{2}}\right)}\right) + x\sqrt[1+\sqrt{3}]{-\sin\left(\frac{5}{\sqrt{2}}\right)}\sqrt[\sqrt{3}-1]{-\cos\left(\frac{5}{\sqrt{2}}\right)}\cos\left(\frac{\pi}{\sqrt{3}-1}\right)\cos\left(\frac{\pi}{1+\sqrt{3}}\right) + i\left(x\sqrt[1+\sqrt{3}]{-\sin\left(\frac{5}{\sqrt{2}}\right)}\sin\left(\frac{\pi}{1+\sqrt{3}}\right)\sqrt[\sqrt{3}-1]{-\cos\left(\frac{5}{\sqrt{2}}\right)}\cos\left(\frac{\pi}{\sqrt{3}-1}\right) + x\sqrt[1+\sqrt{3}]{-\sin\left(\frac{5}{\sqrt{2}}\right)}\sin\left(\frac{\pi}{\sqrt{3}-1}\right)\sqrt[\sqrt{3}-1]{-\cos\left(\frac{5}{\sqrt{2}}\right)}\cos\left(\frac{\pi}{1+\sqrt{3}}\right)\right)$$

Complex solution:

$$x = e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}$$

$$x \approx 2.5070 + 2.8070\,i$$

exp((sqrt3)/2)

Input:

$$\exp\left(\frac{\sqrt{3}}{2}\right)$$

Exact result:

$$e^{\sqrt{3}/2}$$

Decimal approximation:

2.3774426752361647882447607581000454193272537422166474589 87...

2.3774426752…

Property:

$e^{\sqrt{3}/2}$ is a transcendental number

Series representations:

$$e^{\sqrt{3}/2} = e^{1/2\sqrt{2}\sum_{k=0}^{\infty} 2^{-k}\binom{1/2}{k}}$$

$$e^{\sqrt{3}/2} = \exp\left(\frac{1}{2}\sqrt{2}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

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

Integral representation:

$$(1+z)^a = \frac{\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{\Gamma(s)\,\Gamma(-a-s)}{z^s}\,ds}{(2\,\pi\,i)\,\Gamma(-a)} \quad \text{for } (0<\gamma<-\operatorname{Re}(a) \text{ and } |\arg(z)|<\pi)$$

$\operatorname{Re}(z)$ is the real part of z

$\arg(z)$ is the complex argument

$|z|$ is the absolute value of z

Indeed:

e^(sqrt(3)/2) cos(5/sqrt(2))^(1/(1 - sqrt(3))) sin^(-1/(1 + sqrt(3)))(5/sqrt(2)) * ((([sin (5/2*sqrt(3-1))])))^(1/(1+sqrt3)) * ((([cos(5/2*sqrt(3-1))])))^(1/(sqrt3-1))

Input:

$$e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{2}\sqrt{3-1}\right)}\right)$$

Exact result:

$$e^{\sqrt{3}/2}\cos^{1/\left(1-\sqrt{3}\right)+1/\left(\sqrt{3}-1\right)}\left(\frac{5}{\sqrt{2}}\right)$$

Decimal approximation:

2.377442675236164788244760758100045419327253742216647458987...

2.37744267523…

Property:

$$e^{\sqrt{3}/2}\cos^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)$$ is a transcendental number

Alternate forms:

$$e^{\sqrt{3}/2}$$

$$e^{\sqrt{3}/2}\left(\frac{1}{2}\left(e^{-(5i)/\sqrt{2}}+e^{(5i)/\sqrt{2}}\right)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(\sqrt{3}-1\right)}$$

$$e^{\sqrt{3}/2}\left(-\cos\left(\frac{5}{\sqrt{2}}\right)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(\sqrt{3}-1\right)}\cos\left(\left(\frac{1}{1-\sqrt{3}}+\frac{1}{\sqrt{3}-1}\right)\pi\right)+ i\,e^{\sqrt{3}/2}\sin\left(\left(\frac{1}{1-\sqrt{3}}+\frac{1}{\sqrt{3}-1}\right)\pi\right)\left(-\cos\left(\frac{5}{\sqrt{2}}\right)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(\sqrt{3}-1\right)}$$

Alternative representations:

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}$$

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}$$

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5i\sqrt{2}}{2}\right)}\left(-\cos\left(\frac{\pi}{2}+\frac{5}{\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)}\sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2}+\frac{5\sqrt{2}}{2}\right)}$$

Series representations:

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=e^{\sqrt{3}/2}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k 5^{2k}}{(2k)!}\right)^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}$$

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=$$
$$e^{\sqrt{3}/2}\left(-\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{5}{\sqrt{2}}-\frac{\pi}{2}\right)^{1+2k}}{(1+2k)!}\right)^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}$$

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=$$
$$e^{\sqrt{3}/2}\left(\sum_{k=0}^{\infty}(-1)^k J_{2k}(5)\,T_{2k}\left(\frac{1}{\sqrt{2}}\right)(2-\delta_k)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}$$

Multiple-argument formulas:

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=$$
$$e^{\sqrt{3}/2}\left(-1+2\cos^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}$$

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)=$$
$$e^{\sqrt{3}/2}\left(1-2\sin^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}$$

$$\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)$$
$$\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3-1}}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3-1}}{2}\right)}\right) =$$
$$e^{\sqrt{3}/2}\left(-3\cos\left(\frac{5}{3\sqrt{2}}\right)+4\cos^3\left(\frac{5}{3\sqrt{2}}\right)\right)^{1/\left(1-\sqrt{3}\right)+1/\left(-1+\sqrt{3}\right)}$$

From

$$e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{2}\sqrt{3-1}\right)}\right)$$

we obtain also:

1+1/((((2/3*((((e^(sqrt(3)/2) cos(5/sqrt(2))^(1/(1 - sqrt(3))) sin^(-1/(1 + sqrt(3)))(5/sqrt(2)) * ((([sin (5/2*sqrt(3-1))])))^(1/(1+sqrt3)) * ((([cos(5/2*sqrt(3-1))])))^(1/(sqrt3-1)))))))))

Input:

$$1+1\Bigg/\left(\frac{2}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{2}\sqrt{3-1}\right)}\right)\right)\right)$$

Exact result:

$$1+\frac{3}{2}e^{-\sqrt{3}/2}\cos^{-1/\left(1-\sqrt{3}\right)-1/\left(\sqrt{3}-1\right)}\left(\frac{5}{\sqrt{2}}\right)$$

Decimal approximation:

1.630930039081172184697633704895024442261543362481537224472...

1.63093003908….

Property:

$1+\frac{3}{2}e^{-\sqrt{3}/2}\cos^{-1/(1-\sqrt{3})-1/(-1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)$ is a transcendental number

Alternate forms:

$$1+\frac{3}{2}e^{-\sqrt{3}/2}$$

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

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

Alternative representations:

$$1+1\left/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)\right)2\right)\right.=$$
$$1+1\left/\left(\frac{2}{3}e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}\right)\right.$$

$$1+1\left/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)\right)2\right)\right.=$$
$$1+1\left/\left(\frac{2}{3}e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}\right)\right.$$

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)\right)2\right)=$$

$$1+1\Big/\left(\frac{2}{3}\,e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5\,i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5\,i\sqrt{2}}{2}\right)}\left(-\cos\left(\frac{\pi}{2}+\frac{5}{\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)}\sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2}+\frac{5\sqrt{2}}{2}\right)}\right)$$

Series representations:

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)\right)2\right)=$$

$$1+\frac{3}{2}\,e^{-\sqrt{3}/2}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^{k}5^{2k}}{(2k)!}\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)\right)2\right)=$$

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

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)\right)2\right)=$$

$$1+\frac{3}{2}\,e^{-\sqrt{3}/2}\left(\sum_{k=0}^{\infty}(-1)^{k}J_{2k}(5)\,T_{2k}\left(\frac{1}{\sqrt{2}}\right)(2-\delta_{k})\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

Multiple-argument formulas:

$$1+1\Bigg/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3-1}}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3-1}}{2}\right)}\right)\right)2\right) = 1+\frac{3}{2}e^{-\sqrt{3}/2}\left(-1+2\cos^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{-1/(1-\sqrt{3})-1/(-1+\sqrt{3})}$$

$$1+1\Bigg/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3-1}}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3-1}}{2}\right)}\right)\right)2\right) = 1+\frac{3}{2}e^{-\sqrt{3}/2}\left(1-2\sin^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{-1/(1-\sqrt{3})-1/(-1+\sqrt{3})}$$

$$1+1\Bigg/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\left(\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3-1}}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3-1}}{2}\right)}\right)\right)2\right) = 1+\frac{3}{2}e^{-\sqrt{3}/2}\left(-3\cos\left(\frac{5}{3\sqrt{2}}\right)+4\cos^3\left(\frac{5}{3\sqrt{2}}\right)\right)^{-1/(1-\sqrt{3})-1/(-1+\sqrt{3})}$$

and:

1+1/((((2/3*((((e^(sqrt(3)/2) cos(5/sqrt(2))^(1/(1 - sqrt(3))) sin^(-1/(1 + sqrt(3)))(5/sqrt(2)) ((([sin (5/2*sqrt(3-1))])))^(1/(1+sqrt3)) ((([cos(5/2*sqrt(3-1))])))^(1/(sqrt3-1))))))))))-13/10^3

Input:

$$1+1\Bigg/\left(\frac{2}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{2}\sqrt{3-1}\right)}\right)\right)-\frac{13}{10^3}$$

Exact result:

$$\frac{987}{1000} + \frac{3}{2} e^{-\sqrt{3}/2} \cos^{-1/(1-\sqrt{3})-1/(\sqrt{3}-1)}\left(\frac{5}{\sqrt{2}}\right)$$

Decimal approximation:

1.617930039081172184697633704895024442261543362481537224472...

1.61793003908…. result that is a very good approximation to the value of the golden ratio 1.618033988749...

Property:

$$\frac{987}{1000} + \frac{3}{2} e^{-\sqrt{3}/2} \cos^{-1/(1-\sqrt{3})-1/(-1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)$$ is a transcendental number

Alternate forms:

$$\frac{987}{1000} + \frac{3}{2} e^{-\sqrt{3}/2}$$

$$\frac{3\left(329 + 500 e^{-\sqrt{3}/2}\right)}{1000}$$

$$\frac{3 e^{-\sqrt{3}/2}\left(500 + 329 e^{\sqrt{3}/2}\right)}{1000}$$

Alternative representations:

$$1 + 1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)} \sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right) 2\right) - \frac{13}{10^3} =$$

$$1 - \frac{13}{10^3} + 1\Big/\left(\frac{2}{3} e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cosh\left(\frac{5 i}{\sqrt{2}}\right)} \sqrt[-1+\sqrt{3}]{\cosh\left(\frac{5 i \sqrt{2}}{2}\right)} \cos^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2} - \frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2} - \frac{5\sqrt{2}}{2}\right)}\right)$$

$$1+1\Bigg/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$1-\frac{13}{10^3}+1\Bigg/\left(\frac{2}{3}e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}\right)$$

$$1+1\Bigg/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$1-\frac{13}{10^3}+1\Bigg/\left(\frac{2}{3}e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5i\sqrt{2}}{2}\right)}\left(-\cos\left(\frac{\pi}{2}+\frac{5}{\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)}\sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2}+\frac{5\sqrt{2}}{2}\right)}\right)$$

Series representations:

$$1+1\Bigg/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$\frac{987}{1000}+\frac{3}{2}e^{-\sqrt{3}/2}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k 5^{2k}}{(2k)!}\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\,\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\,\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$\frac{987}{1000}+\frac{3}{2}\,e^{-\sqrt{3}/2}\left(-\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{5}{\sqrt{2}}-\frac{\pi}{2}\right)^{1+2k}}{(1+2k)!}\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\,\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\,\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$\frac{987}{1000}+\frac{3}{2}\,e^{-\sqrt{3}/2}\left(\sum_{k=0}^{\infty}(-1)^k J_{2k}(5)\,T_{2k}\left(\frac{1}{\sqrt{2}}\right)(2-\delta_k)\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

Multiple-argument formulas:

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\,\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\,\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$\frac{987}{1000}+\frac{3}{2}\,e^{-\sqrt{3}/2}\left(-1+2\cos^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\,\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\,\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$\frac{987}{1000}+\frac{3}{2}\,e^{-\sqrt{3}/2}\left(1-2\sin^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

$$1+1\Big/\left(\frac{1}{3}\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5\sqrt{3}-1}{2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5\sqrt{3}-1}{2}\right)}\right)2\right)-\frac{13}{10^3}=$$

$$\frac{987}{1000}+\frac{3}{2}e^{-\sqrt{3}/2}\left(-3\cos\left(\frac{5}{3\sqrt{2}}\right)+4\cos^3\left(\frac{5}{3\sqrt{2}}\right)\right)^{-1/\left(1-\sqrt{3}\right)-1/\left(-1+\sqrt{3}\right)}$$

From the same expression, we obtain also:

2*(((((e^(sqrt(3)/2) cos(5/sqrt(2))^(1/(1 - sqrt(3))) sin^(-1/(1 + sqrt(3)))(5/sqrt(2)) ((([sin (5/2*sqrt(3-1))])))^(1/(1+sqrt3)) ((([cos(5/2*sqrt(3-1))])))^(1/(sqrt3-1)))))))^4

Input:

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

Exact result:

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

Decimal approximation:

63.895491011769862995888564709849990100678315230128551082 89...

63.89549101…≈ 64

Property:

$2e^{2\sqrt{3}}\cos^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)$ is a transcendental number

Alternate forms:

$$2e^{2\sqrt{3}}$$

$$2^{1-4/\left(1-\sqrt{3}\right)-4/\left(\sqrt{3}-1\right)}e^{2\sqrt{3}}\left(e^{-(5i)/\sqrt{2}}+e^{(5i)/\sqrt{2}}\right)^{4/\left(1-\sqrt{3}\right)+4/\left(\sqrt{3}-1\right)}$$

$$2\, e^{2\sqrt{3}} \left(-\cos\left(\frac{5}{\sqrt{2}}\right)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(\sqrt{3}-1\right)} \cos\left(\left(\frac{4}{1-\sqrt{3}} + \frac{4}{\sqrt{3}-1}\right)\pi\right) +$$
$$2\, i\, e^{2\sqrt{3}} \sin\left(\left(\frac{4}{1-\sqrt{3}} + \frac{4}{\sqrt{3}-1}\right)\pi\right)\left(-\cos\left(\frac{5}{\sqrt{2}}\right)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(\sqrt{3}-1\right)}$$

Alternative representations:

$$2\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)} \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4 =$$
$$2\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cosh\left(\frac{5\, i}{\sqrt{2}}\right)} \sqrt[-1+\sqrt{3}]{\cosh\left(\frac{5\, i\sqrt{2}}{2}\right)} \cos^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2} - \frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2} - \frac{5\sqrt{2}}{2}\right)}\right)^4$$

$$2\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)} \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4 =$$
$$2\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5\, i}{\sqrt{2}}\right)} \sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5\, i\sqrt{2}}{2}\right)} \cos^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2} - \frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2} - \frac{5\sqrt{2}}{2}\right)}\right)^4$$

$$2\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)} \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right) \sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4 =$$
$$2\left(e^{\sqrt{3}/2} \sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5\, i}{\sqrt{2}}\right)} \sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5\, i\sqrt{2}}{2}\right)} \left(-\cos\left(\frac{\pi}{2} + \frac{5}{\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)} \sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2} + \frac{5\sqrt{2}}{2}\right)}\right)^4$$

Series representations:

$$2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4 = 2\,e^{2\sqrt{3}}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k 5^{2k}}{(2k)!}\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4 = 2\,e^{2\sqrt{3}}\left(-\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{5}{\sqrt{2}}-\frac{\pi}{2}\right)^{1+2k}}{(1+2k)!}\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4 = 2\,e^{2\sqrt{3}}\left(\sum_{k=0}^{\infty}(-1)^k J_{2k}(5)\,T_{2k}\left(\frac{1}{\sqrt{2}}\right)(2-\delta_k)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

Multiple-argument formulas:

$$2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4 = 2\,e^{2\sqrt{3}}\left(-1+2\cos^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4 = 2\,e^{2\sqrt{3}}\left(1-2\sin^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{4/(1-\sqrt{3})+4/(-1+\sqrt{3})}$$

$$2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4 = 2\,e^{2\sqrt{3}}\left(-3\cos\left(\frac{5}{3\sqrt{2}}\right)+4\cos^3\left(\frac{5}{3\sqrt{2}}\right)\right)^{4/(1-\sqrt{3})+4/(-1+\sqrt{3})}$$

and again:

27*2*(((((e^(sqrt(3)/2) cos(5/sqrt(2))^(1/(1 - sqrt(3))) sin^(-1/(1 + sqrt(3)))(5/sqrt(2)) ((([sin (5/2*sqrt(3-1))])))^(1/(1+sqrt3)) ((([cos(5/2*sqrt(3-1))])))^(1/(sqrt3-1)))))))^4+4

Input:

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{5}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{5}{2}\sqrt{3-1}\right)}\right)^4+4$$

Exact result:

$$4+54\,e^{2\sqrt{3}}\cos^{4/(1-\sqrt{3})+4/(\sqrt{3}-1)}\left(\frac{5}{\sqrt{2}}\right)$$

Decimal approximation:

1729.178257317786300888991247165949732718314511213470879238...

1729.1782573…. This result is very near to the mass of candidate glueball **f_0(1710) scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

Property:

$4+54e^{2\sqrt{3}}\cos^{4/(1-\sqrt{3})+4/(-1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)$ is a transcendental number

Alternate forms:

$$4+54e^{2\sqrt{3}}$$

$$2\left(2+27e^{2\sqrt{3}}\right)$$

$$4+27\times 2^{1-4/(1-\sqrt{3})-4/(\sqrt{3}-1)}e^{2\sqrt{3}}\left(e^{-(5i)/\sqrt{2}}+e^{(5i)/\sqrt{2}}\right)^{4/(1-\sqrt{3})+4/(\sqrt{3}-1)}$$

Alternative representations:

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4+4=$$
$$4+54\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}\right)^4$$

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/(1+\sqrt{3})}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4+4=$$
$$4+54\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5i\sqrt{2}}{2}\right)}\cos^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2}-\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{5\sqrt{2}}{2}\right)}\right)^4$$

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4+4=$$

$$4+54\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cosh\left(-\frac{5\,i}{\sqrt{2}}\right)}\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{5\,i\sqrt{2}}{2}\right)}\left(-\cos\left(\frac{\pi}{2}+\frac{5}{\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)}\sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2}+\frac{5\sqrt{2}}{2}\right)}\right)^4$$

Series representations:

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4+4=$$

$$4+54\,e^{2\sqrt{3}}\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k 5^{2k}}{(2k)!}\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4+4=$$

$$4+54\,e^{2\sqrt{3}}\left(-\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{5}{\sqrt{2}}-\frac{\pi}{2}\right)^{1+2k}}{(1+2k)!}\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\;5\right)}\right)^4+4=$$

$$4+54\,e^{2\sqrt{3}}\left(\sum_{k=0}^{\infty}(-1)^k J_{2k}(5)\,T_{2k}\left(\frac{1}{\sqrt{2}}\right)(2-\delta_k)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

Multiple-argument formulas:

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\ \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4+4=$$

$$4+54\,e^{2\sqrt{3}}\left(-1+2\cos^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\ \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4+4=$$

$$4+54\,e^{2\sqrt{3}}\left(1-2\sin^2\left(\frac{5}{2\sqrt{2}}\right)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

$$27\times 2\left(e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{5}{\sqrt{2}}\right)}\ \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{5}{\sqrt{2}}\right)\sqrt[1+\sqrt{3}]{\sin\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{1}{2}\sqrt{3-1}\ 5\right)}\right)^4+4=$$

$$4+54\,e^{2\sqrt{3}}\left(-3\cos\left(\frac{5}{3\sqrt{2}}\right)+4\cos^3\left(\frac{5}{3\sqrt{2}}\right)\right)^{4/\left(1-\sqrt{3}\right)+4/\left(-1+\sqrt{3}\right)}$$

From:

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

Now, from the following Ramanujan equation

$$64(g_{58}^{24}+g_{58}^{-24})=e^{\pi\sqrt{58}}-24+4372e^{-\pi\sqrt{58}}+\cdots=64\left\{\left(\frac{5+\sqrt{29}}{2}\right)^{12}+\left(\frac{5-\sqrt{29}}{2}\right)^{12}\right\}.$$

we have that:

e^(Pi*sqrt58)-24+4372e^(-Pi*sqrt58)

Input:

$$e^{\pi\sqrt{58}} - 24 + 4372\, e^{-\pi\sqrt{58}}$$

Exact result:

$$-24 + 4372\, e^{-\sqrt{58}\,\pi} + e^{\sqrt{58}\,\pi}$$

Decimal approximation:

$$2.459125772799999999999999984082812699312009648766850 8\ldots \times 10^{10}$$

24591257727.999 ≈ 24591257728

Property:

$-24 + 4372\, e^{-\sqrt{58}\,\pi} + e^{\sqrt{58}\,\pi}$ is a transcendental number

Alternate form:

$$e^{-\sqrt{58}\,\pi}\left(4372 - 24\, e^{\sqrt{58}\,\pi} + e^{2\sqrt{58}\,\pi}\right)$$

Series representations:

$$e^{\pi\sqrt{58}} - 24 + 4372\, e^{-\pi\sqrt{58}} = e^{-\pi\sqrt{57}\sum_{k=0}^{\infty} 57^{-k}\binom{1/2}{k}}\left(4372 - 24\, e^{\pi\sqrt{57}\sum_{k=0}^{\infty} 57^{-k}\binom{1/2}{k}} + e^{2\pi\sqrt{57}\sum_{k=0}^{\infty} 57^{-k}\binom{1/2}{k}}\right)$$

$$e^{\pi\sqrt{58}} - 24 + 4372\, e^{-\pi\sqrt{58}} = \exp\left(-\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\left(4372 - 24\, e^{\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}} + \exp\left(2\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)$$

$$e^{\pi\sqrt{58}} - 24 + 4372\, e^{-\pi\sqrt{58}} = \exp\left(-\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (58-z_0)^k z_0^{-k}}{k!}\right)$$
$$\left(4372 - 24\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (58-z_0)^k z_0^{-k}}{k!}\right) + \exp\left(2\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (58-z_0)^k z_0^{-k}}{k!}\right)\right)$$
for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

That is equal to:

64[((5+sqrt29)/2)^12+((5-sqrt29)/2)^12]

Input:

$$64\left(\left(\frac{1}{2}\left(5+\sqrt{29}\right)\right)^{12} + \left(\frac{1}{2}\left(5-\sqrt{29}\right)\right)^{12}\right)$$

Result:

24591257728

Decimal approximation:

$2.4591257728000000000000000000000000000000000000000... \times 10^{10}$

24591257728

and from which, we obtain:

(((e^(Pi*sqrt58)-24+4372e^(-Pi*sqrt58))))*1/[((5+sqrt29)/2)^12+((5-sqrt29)/2)^12]

Input:

$$\left(e^{\pi\sqrt{58}} - 24 + 4372\, e^{-\pi\sqrt{58}}\right) \times \frac{1}{\left(\frac{1}{2}\left(5+\sqrt{29}\right)\right)^{12} + \left(\frac{1}{2}\left(5-\sqrt{29}\right)\right)^{12}}$$

Exact result:

$$\frac{-24 + 4372\, e^{-\sqrt{58}\,\pi} + e^{\sqrt{58}\,\pi}}{\frac{\left(5-\sqrt{29}\right)^{12}}{4096} + \frac{\left(5+\sqrt{29}\right)^{12}}{4096}}$$

Decimal approximation:

63.99999999999999999999999958574709821201082469541529302902...

63.99999…≈ 64

Property:

$$\frac{-24 + 4372 e^{-\sqrt{58}\,\pi} + e^{\sqrt{58}\,\pi}}{\frac{(5-\sqrt{29})^{12}}{4096} + \frac{(5+\sqrt{29})^{12}}{4096}}$$ is a transcendental number

Alternate forms:

$$\frac{-24 + 4372 e^{-\sqrt{58}\,\pi} + e^{\sqrt{58}\,\pi}}{384\,238\,402}$$

$$-\frac{12}{192\,119\,201} + \frac{2186 e^{-\sqrt{58}\,\pi}}{192\,119\,201} + \frac{e^{\sqrt{58}\,\pi}}{384\,238\,402}$$

$$\frac{e^{-\sqrt{58}\,\pi}\left(4372 - 24 e^{\sqrt{58}\,\pi} + e^{2\sqrt{58}\,\pi}\right)}{384\,238\,402}$$

Series representations:

$$\frac{e^{\pi\sqrt{58}} - 24 + 4372 e^{-\pi\sqrt{58}}}{\left(\frac{1}{2}(5+\sqrt{29})\right)^{12} + \left(\frac{1}{2}(5-\sqrt{29})\right)^{12}} = \left(2048 e^{-\pi\sqrt{57}\sum_{k=0}^{\infty} 57^{-k}\binom{1/2}{k}}\left(4372 - 24 e^{\pi\sqrt{57}\sum_{k=0}^{\infty} 57^{-k}\binom{1/2}{k}} + e^{2\pi\sqrt{57}\sum_{k=0}^{\infty} 57^{-k}\binom{1/2}{k}}\right)\right) \Big/ \left(\left(625 + 150\sqrt{28}^{\,2}\left(\sum_{k=0}^{\infty} 28^{-k}\binom{\frac{1}{2}}{k}\right)^2 + \sqrt{28}^{\,4}\left(\sum_{k=0}^{\infty} 28^{-k}\binom{\frac{1}{2}}{k}\right)^4\right)\left(390\,625 + 937\,500\sqrt{28}^{\,2}\left(\sum_{k=0}^{\infty} 28^{-k}\binom{\frac{1}{2}}{k}\right)^2 + 83\,750\sqrt{28}^{\,4}\left(\sum_{k=0}^{\infty} 28^{-k}\binom{\frac{1}{2}}{k}\right)^4 + 1500\sqrt{28}^{\,6}\left(\sum_{k=0}^{\infty} 28^{-k}\binom{\frac{1}{2}}{k}\right)^6 + \sqrt{28}^{\,8}\left(\sum_{k=0}^{\infty} 28^{-k}\binom{\frac{1}{2}}{k}\right)^8\right)\right)$$

$$\frac{e^{\pi \sqrt{58}} - 24 + 4372\, e^{-\pi \sqrt{58}}}{\left(\frac{1}{2}\left(5+\sqrt{29}\right)\right)^{12} + \left(\frac{1}{2}\left(5-\sqrt{29}\right)\right)^{12}} = \left(2048 \exp\left(-\pi \sqrt{57} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{57}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)\right.$$

$$\left(4372 - 24\, e^{\pi \sqrt{57} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{57}\right)^k \left(-\frac{1}{2}\right)_k}{k!}} + \exp\left(2\,\pi \sqrt{57} \sum_{k=0}^{\infty} \frac{\left(-\frac{1}{57}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Bigg)\Bigg/$$

$$\left(\left(625 + 150 \sqrt{28}^{\,2} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{28}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)^2 + \sqrt{28}^{\,4} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{28}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)^4\right)\left(390\,625 + \right.\right.$$

$$937\,500 \sqrt{28}^{\,2} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{28}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)^2 + 83\,750 \sqrt{28}^{\,4} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{28}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)^4 +$$

$$\left.\left.1500 \sqrt{28}^{\,6} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{28}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)^6 + \sqrt{28}^{\,8} \left(\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{28}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)^8\right)\right)$$

$$\frac{e^{\pi\sqrt{58}} - 24 + 4372\, e^{-\pi\sqrt{58}}}{\left(\frac{1}{2}\left(5+\sqrt{29}\right)\right)^{12} + \left(\frac{1}{2}\left(5-\sqrt{29}\right)\right)^{12}} =$$

$$-\left(24 \Bigg/ \left(\frac{\left(5 - \exp\left(i\pi\left\lfloor\frac{\arg(29-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (29-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}}{4096} + \frac{\left(5 + \exp\left(i\pi\left\lfloor\frac{\arg(29-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (29-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}}{4096}\right)\right) +$$

$$\left(4372 \exp\left(-\pi \exp\left(i\pi\left\lfloor\frac{\arg(58-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (58-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right) \Bigg/$$

$$\left(\frac{\left(5 - \exp\left(i\pi\left\lfloor\frac{\arg(29-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (29-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}}{4096} + \frac{\left(5 + \exp\left(i\pi\left\lfloor\frac{\arg(29-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (29-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}}{4096}\right) +$$

$$\exp\left(\pi \exp\left(i\pi\left\lfloor\frac{\arg(58-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (58-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right) \Bigg/$$

$$\left(\frac{\left(5 - \exp\left(i\pi\left\lfloor\frac{\arg(29-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (29-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}}{4096} + \frac{\left(5 + \exp\left(i\pi\left\lfloor\frac{\arg(29-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k (29-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^{12}}{4096}\right)$$

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

Thence, we have the following mathematical connection between the two previous formulas:

$$\left(2\, e^{2\sqrt{3}}\, \cos^{4/\left(1-\sqrt{3}\right)+4/\left(\sqrt{3}-1\right)}\left(\frac{5}{\sqrt{2}}\right)\right) = 63.89549101\ldots$$

$$\left(\frac{-24+4372\, e^{-\sqrt{58}\,\pi}+e^{\sqrt{58}\,\pi}}{\frac{\left(5-\sqrt{29}\right)^{12}}{4096}+\frac{\left(5+\sqrt{29}\right)^{12}}{4096}}\right) = 63.99999\ldots$$

Now, again

There is also a "supercritical" region of parameter space, which is characterized by logarithmic slopes $\gamma > 1$. In this case there are two singularities at the ends of the *finite* interval $\tau \in (0, \pi/\sqrt{\gamma^2-1})$ of "parametric" time, which spans the whole cosmological evolution. The scalar continues to emerge from the Big Bang while climbing up the potential, experiences a turning point as in the previous cases and then climbs down the potential, approaching an infinite speed in "parametric" time but still coming to rest in terms of the cosmological time η. The corresponding expressions for the space–time metric and the string coupling,

$$\begin{aligned} ds^2 &= e^{\frac{2\alpha_0}{D-1}} \left[\sin\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{\frac{2}{(1+\gamma)(D-1)}} \left[\cos\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{-\frac{2}{(\gamma-1)(D-1)}} d\mathbf{x}\cdot d\mathbf{x} \\ &- e^{-2\gamma\varphi_0} \left[\sin\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{-\frac{2\gamma}{1+\gamma}} \left[\cos\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{-\frac{2\gamma}{\gamma-1}} \left(\frac{d\tau}{M\beta}\right)^2 , \\ e^{\varphi} &= e^{\varphi_0} \left[\sin\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{\frac{1}{1+\gamma}} \left[\cos\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{\frac{1}{\gamma-1}} , \end{aligned} \tag{2.15}$$

For τ = Pi/2, we obtain:

$$e^{\varphi} = e^{\varphi_0} \left[\sin\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{\frac{1}{1+\gamma}} \left[\cos\left(\frac{\tau}{2}\sqrt{\gamma^2-1}\right)\right]^{\frac{1}{\gamma-1}}$$

exp((sqrt3)/2) *1/ (((((([sin(((Pi/2))/2*sqrt(3-1))]))^(1/(1+sqrt3)) * ((([cos(((Pi/2))/2*sqrt(3-1))]))^(1/(sqrt3-1)))))

Input:

$$\exp\left(\frac{\sqrt{3}}{2}\right)\times\frac{1}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}}$$

Exact result:

$$e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)$$

Decimal approximation:

7.502842508851486273647034896535329943207514107121114768359...

7.5028425088…

Alternate forms:

$$e^{\sqrt{3}/2}\sin^{1/2(1-\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{1/2(-1-\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)$$

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

Alternative representations:

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times2}\right)}}=\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cosh\left(\frac{1}{4}i\pi\sqrt{2}\right)}\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{\pi\sqrt{2}}{4}\right)}}$$

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times2}\right)}}=\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{1}{4}i\pi\sqrt{2}\right)}\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{\pi\sqrt{2}}{4}\right)}}$$

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = \frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{1}{4}\,i\,\pi\sqrt{2}\right)}\ \sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2}+\frac{\pi\sqrt{2}}{4}\right)}}$$

Series representations:

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = e^{\sqrt{3}/2}\ \sqrt[1-\sqrt{3}]{\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{8}\right)^k \pi^{2k}}{(2k)!}}\ \left(\sum_{k=0}^{\infty}\frac{(-1)^k\, 2^{-3/2-3k}\, \pi^{1+2k}}{(1+2k)!}\right)^{-1/\left(1+\sqrt{3}\right)}$$

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = 2^{5/\left(2\left(1+\sqrt{3}\right)\right)}\, e^{\sqrt{3}/2}\, \pi^{-3/\left(2\left(1+\sqrt{3}\right)\right)} \left(\sum_{k=0}^{\infty}\frac{(-1)^k\, 2^{-3k}\, \pi^{2k}}{(2k)!}\right)^{-1/\left(-1+\sqrt{3}\right)} \left(\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\frac{32^s\,\pi^{-2s}\,\Gamma(s)}{\Gamma\left(\frac{3}{2}-s\right)}\right)^{-1/\left(1+\sqrt{3}\right)}$$

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = \sqrt[2+2\sqrt{3}]{32}\ e^{\sqrt{3}/2}\ \pi^{3/4-\left(3\sqrt{3}\right)/4}\ \sqrt[1-\sqrt{3}]{\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{8}\right)^k \pi^{2k}}{(2k)!}}\ \left(\sum_{j=0}^{\infty}\operatorname{Res}_{s=-j}\frac{32^s\,\pi^{-2s}\,\Gamma(s)}{\Gamma\left(\frac{3}{2}-s\right)}\right)^{-1/\left(1+\sqrt{3}\right)}$$

Multiple-argument formulas:

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = e^{\sqrt{3}/2}\cos^{-1/\left(-1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\left(2\cos\left(\frac{\pi}{4\sqrt{2}}\right)\sin\left(\frac{\pi}{4\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)}$$

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = e^{\sqrt{3}/2}\cos^{-1/(-1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\left(3\sin\left(\frac{\pi}{6\sqrt{2}}\right)-4\sin^3\left(\frac{\pi}{6\sqrt{2}}\right)\right)^{-1/(1+\sqrt{3})}$$

$$\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}} = e^{\sqrt{3}/2}\left(-1+2\cos^2\left(\frac{\pi}{4\sqrt{2}}\right)\right)^{-1/(-1+\sqrt{3})}\left(2\cos\left(\frac{\pi}{4\sqrt{2}}\right)\sin\left(\frac{\pi}{4\sqrt{2}}\right)\right)^{-1/(1+\sqrt{3})}$$

Indeed:

7.5028425 * ((((((([sin(((Pi/2))/2*sqrt(3-1))])))^(1/(1+sqrt3)) * ((([cos(((Pi/2))/2*sqrt(3-1))])))^(1/(sqrt3-1)))))

Input interpretation:

$$7.5028425\left(\sqrt[1+\sqrt{3}]{\sin\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}\right)$$

Result:

2.3774427...

2.3774427…

Alternative representations:

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)} = 7.50284\sqrt[-1+\sqrt{3}]{\cosh\left(\frac{1}{4}i\pi\sqrt{2}\right)}\ \sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{\pi\sqrt{2}}{4}\right)}$$

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)} = 7.50284\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{1}{4}\,i\,\pi\sqrt{2}\right)}\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{\pi\sqrt{2}}{4}\right)}$$

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)} = 7.50284\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{1}{4}\,i\,\pi\sqrt{2}\right)}\sqrt[1+\sqrt{3}]{-\cos\left(\frac{\pi}{2}+\frac{\pi\sqrt{2}}{4}\right)}$$

Series representations:

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)} = 7.50284\sqrt[-1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}]{\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{16}\right)^k\left(\pi\sqrt{2}\right)^{2k}}{(2k)!}}\sqrt[1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}]{\sum_{k=0}^{\infty}\frac{(-1)^k 4^{-1-2k}\left(\pi\sqrt{2}\right)^{1+2k}}{(1+2k)!}}$$

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

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)} = 7.50284\sqrt[1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}]{\sqrt{2}}\sqrt[1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}]{\sum_{k=0}^{\infty}(-1)^k J_{1+2k}\left(\frac{\pi\sqrt{2}}{4}\right)}\sqrt[-1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}]{\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{16}\right)^k\left(\pi\sqrt{2}\right)^{2k}}{(2k)!}}$$

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

$$7.50284 \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} = 7.50284$$

$$-1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\sqrt{J_0\left(\frac{\pi\sqrt{2}}{4}\right)+2\sum_{k=1}^{\infty}(-1)^k J_{2k}\left(\frac{\pi\sqrt{2}}{4}\right)}$$

$$1+\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\sqrt{\sum_{k=0}^{\infty}\frac{(-1)^k 4^{-1-2k}(\pi\sqrt{2})^{1+2k}}{(1+2k)!}}$$

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

Integral representations:

$$7.50284 \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} =$$

$$7.50284 \times 4^{-1/(1+\sqrt{3})} \sqrt[-1+\sqrt{3}]{-\int_{\frac{\pi}{2}}^{\frac{\pi\sqrt{2}}{4}}\sin(t)\,dt} \sqrt[1+\sqrt{3}]{\pi\sqrt{2}\int_0^1\cos\left(\frac{1}{4}\pi t\sqrt{2}\right)dt}$$

$$7.50284 \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} = 7.50284 \times 4^{-1/(1+\sqrt{3})}$$

$$\sqrt[1+\sqrt{3}]{\pi\sqrt{2}\int_0^1\cos\left(\frac{1}{4}\pi t\sqrt{2}\right)dt} \sqrt[-1+\sqrt{3}]{1-\frac{\pi\sqrt{2}}{4}\int_0^1\sin\left(\frac{1}{4}\pi t\sqrt{2}\right)dt}$$

$$7.50284 \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} = 7.50284 \times 16^{-1/(1+\sqrt{3})}$$

$$\sqrt[-1+\sqrt{3}]{-\int_{\frac{\pi}{2}}^{\frac{\pi\sqrt{2}}{4}}\sin(t)\,dt} \sqrt[1+\sqrt{3}]{\frac{\sqrt{2}\sqrt{\pi}}{i}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{s-(\pi^2\sqrt{2}^2)/(64s)}}{s^{3/2}}\,ds} \quad \text{for } \gamma > 0$$

Multiple-argument formulas:

$$7.50284 \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} =$$

$$7.50284 \sqrt[1+\sqrt{3}]{2} \sqrt[-1+\sqrt{3}]{-1+2\cos^2\left(\frac{\pi\sqrt{2}}{8}\right)} \sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi\sqrt{2}}{8}\right)\sin\left(\frac{\pi\sqrt{2}}{8}\right)}$$

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} =$$
$$7.50284\sqrt[1+\sqrt{3}]{\sqrt{2}}\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi\sqrt{2}}{8}\right)\sin\left(\frac{\pi\sqrt{2}}{8}\right)}\sqrt[-1+\sqrt{3}]{1-2\sin^2\left(\frac{\pi\sqrt{2}}{8}\right)}$$

$$7.50284\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)} =$$
$$7.50284\sqrt[-1+\sqrt{3}]{-1+2\cos^2\left(\frac{\pi\sqrt{2}}{8}\right)}\sqrt[1+\sqrt{3}]{3\sin\left(\frac{\pi\sqrt{2}}{12}\right)-4\sin^3\left(\frac{\pi\sqrt{2}}{12}\right)}$$

and:

exp((sqrt3)/2)

Input:

$$\exp\left(\frac{\sqrt{3}}{2}\right)$$

Exact result:

$$e^{\sqrt{3}/2}$$

Decimal approximation:

2.3774426752361647882447607581000454193272537422166474589 87...

2.3774426752…

Property:

$e^{\sqrt{3}/2}$ is a transcendental number

Series representations:

$$e^{\sqrt{3}/2} = e^{1/2\sqrt{2}\sum_{k=0}^{\infty}2^{-k}\binom{1/2}{k}}$$

$$e^{\sqrt{3}/2} = \exp\left(\frac{1}{2}\sqrt{2}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{2}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e^{\sqrt{3}/2} = \exp\left(\frac{\sum_{j=0}^{\infty} \text{Res}_{s=-\frac{1}{2}+j} 2^{-s} \Gamma\left(-\frac{1}{2} - s\right) \Gamma(s)}{4\sqrt{\pi}}\right)$$

Integral representation:

$$(1+z)^a = \frac{\int_{-i\infty+\gamma}^{i\infty+\gamma} \frac{\Gamma(s)\Gamma(-a-s)}{z^s} \, ds}{(2\pi i)\Gamma(-a)} \quad \text{for } (0 < \gamma < -\text{Re}(a) \text{ and } |\arg(z)| < \pi)$$

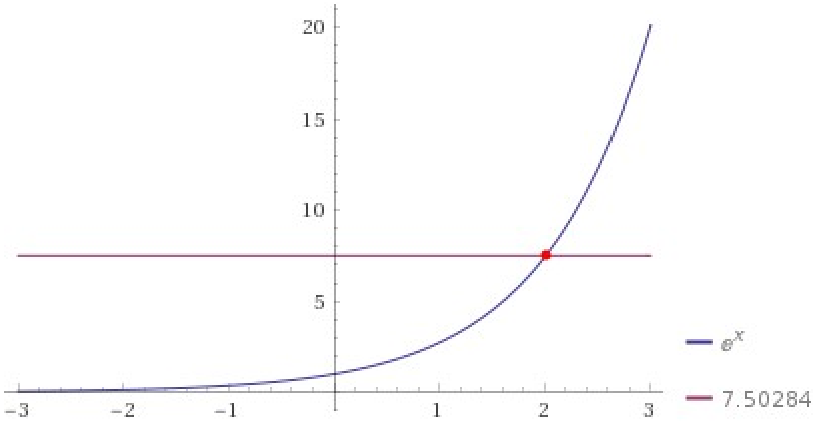
From

e^x = 7.5028425

Input interpretation:

$e^x = 7.5028425$

Plot:



Real solution:

$x \approx 2.01528$

2.01528

Solution:

$x \approx i(6.28319 n + (-2.01528 i)), \quad n \in \mathbb{Z}$

Thence, from

e^{φ_0}

we obtain: $\varphi_0 = 2.01528$

From the previous expression,

$$e^{\sqrt{3}/2} \sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right) \cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)$$

we obtain, obviously, also:

ln((((exp((sqrt3)/2) *1/ ((((((([sin(((Pi/2))/2*sqrt(3-1))])))^(1/(1+sqrt3)) * ((([cos(((Pi/2))/2*sqrt(3-1))])))^(1/(sqrt3-1))))))))

Input:

$$\log\left(\exp\left(\frac{\sqrt{3}}{2}\right) \times \frac{1}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}}\right)$$

log(x) is the natural logarithm

Exact result:

$$\log\left(e^{\sqrt{3}/2} \sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right) \cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)$$

Decimal approximation:

2.015281949919657289769309693172746782605692791534568907116...

2.01528…. that is $\varphi_0 = 2.01528$

Alternate forms:

$$\frac{1}{2}\left(\sqrt{3} + \log\left(\tan\left(\frac{\pi}{2\sqrt{2}}\right)\right) + \sqrt{3}\log\left(2\csc\left(\frac{\pi}{\sqrt{2}}\right)\right)\right)$$

$$\frac{\sqrt{3}}{2} - \frac{\log\left(\sin\left(\frac{\pi}{2\sqrt{2}}\right)\right)}{1+\sqrt{3}} + \frac{\log\left(\cos\left(\frac{\pi}{2\sqrt{2}}\right)\right)}{1-\sqrt{3}}$$

$$\log\left(e^{\sqrt{3}/2}\sin^{1/2\left(1-\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{1/2\left(-1-\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)$$

csc(x) is the cosecant function

Alternative representations:

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)=\log_e\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cos\left(\frac{\pi\sqrt{2}}{4}\right)}\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{2}}{4}\right)}}\right)$$

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)=$$
$$\log(a)\log_a\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cos\left(\frac{\pi\sqrt{2}}{4}\right)}\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{2}}{4}\right)}}\right)$$

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)=$$
$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{1}{4}i\pi\sqrt{2}\right)}\sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{\pi\sqrt{2}}{4}\right)}}\right)$$

Series representations:

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)=$$
$$\log\left(-1+e^{\sqrt{3}/2}\cos^{-1/\left(-1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-$$
$$\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{-1+e^{\sqrt{3}/2}\cos^{-1/\left(-1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)}\right)^k}{k}$$

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}}\right)=$$

$$\log\left(-1+e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{\pi}{2\sqrt{2}}\right)}\ \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-$$

$$\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{-1+e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{\pi}{2\sqrt{2}}\right)}\ \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)}\right)^{k}}{k}$$

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}}\right)=$$

$$\log\left(-1+e^{\sqrt{3}/2}\cos^{-1/\left(-1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-$$

$$\sum_{k=1}^{\infty}\frac{\left(-\frac{1}{-1+e^{\sqrt{3}/2}\sqrt[1-\sqrt{3}]{\cos\left(\frac{\pi}{2\sqrt{2}}\right)}\ \sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)}\right)^{k}}{k}$$

Multiple-argument formulas:

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}}\right)=$$

$$\frac{\sqrt{3}}{2}+\log\left(\cos^{-1/\left(-1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)$$

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3}-1}{2\times 2}\right)}}\right)=$$

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

$$\log\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right) =$$

$$\log\left(e^{\sqrt{3}/2}\cos^{-1/\left(-1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\left(3\sin\left(\frac{\pi}{6\sqrt{2}}\right)-4\sin^3\left(\frac{\pi}{6\sqrt{2}}\right)\right)^{-1/\left(1+\sqrt{3}\right)}\right)$$

From which:

sqrt2+[((((ln((((exp((sqrt3)/2) *1/ ((((((([sin(((Pi/2))/2*sqrt(3-1))])))^(1/(1+sqrt3)) * ((([cos(((Pi/2))/2*sqrt(3-1))])))^(1/(sqrt3-1)))))))))))^6-3)]^2

Input:

$$\sqrt{2}+\left(\log^6\left(\exp\left(\frac{\sqrt{3}}{2}\right)\times\frac{1}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}}\right)-3\right)^2$$

log(x) is the natural logarithm

Exact result:

$$\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/\left(1+\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/\left(\sqrt{3}-1\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2$$

Decimal approximation:

4096.231298908550489794891520221450160231369745733406299823...

4096.2312989… ≈ 4096

Alternate forms:

$$\sqrt{2}+\left(3-\frac{1}{64}\left(\sqrt{3}\left(\log\left(\sin\left(\frac{\pi}{2\sqrt{2}}\right)\right)-1\right)+\sqrt{3}\log\left(\cos\left(\frac{\pi}{2\sqrt{2}}\right)\right)+\log\left(\cot\left(\frac{\pi}{2\sqrt{2}}\right)\right)\right)^6\right)^2$$

$$\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{1/2\left(1-\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{1/2\left(-1-\sqrt{3}\right)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2$$

$$\sqrt{2}+\left(-3+\log^6\left(2^{1/\left(\sqrt{3}-1\right)+1/\left(1+\sqrt{3}\right)}e^{\sqrt{3}/2}\left(i\left(e^{-(i\pi)/\left(2\sqrt{2}\right)}-e^{(i\pi)/\left(2\sqrt{2}\right)}\right)\right)^{-1/\left(1+\sqrt{3}\right)}\left(e^{-(i\pi)/\left(2\sqrt{2}\right)}+e^{(i\pi)/\left(2\sqrt{2}\right)}\right)^{-1/\left(\sqrt{3}-1\right)}\right)\right)^2$$

cot(x) is the cotangent function

Alternative representations:

$$\sqrt{2}+\left(\log^6\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)-3\right)^2 = \left(-3+\log_e^6\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cos\left(\frac{\pi\sqrt{2}}{4}\right)}\ \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{2}}{4}\right)}}\right)\right)^2+\sqrt{2}$$

$$\sqrt{2}+\left(\log^6\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)-3\right)^2 = \left(-3+\left(\log(a)\log_a\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cos\left(\frac{\pi\sqrt{2}}{4}\right)}\ \sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{2}}{4}\right)}}\right)\right)^6\right)^2+\sqrt{2}$$

$$\sqrt{2}+\left(\log^6\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}\ \sqrt[\sqrt{3}-1]{\cos\left(\frac{\pi\sqrt{3-1}}{2\times 2}\right)}}\right)-3\right)^2 = \left(-3+\log^6\left(\frac{\exp\left(\frac{\sqrt{3}}{2}\right)}{\sqrt[-1+\sqrt{3}]{\cosh\left(-\frac{1}{4}i\pi\sqrt{2}\right)}\ \sqrt[1+\sqrt{3}]{\cos\left(\frac{\pi}{2}-\frac{\pi\sqrt{2}}{4}\right)}}\right)\right)^2+\sqrt{2}$$

Now, from the Ramanujan equations (see previous reference):

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

$$64(g_{58}^{24}+g_{58}^{-24}) = e^{\pi\sqrt{58}} - 24 + 4372e^{-\pi\sqrt{58}} + \cdots = 64\left\{\left(\frac{5+\sqrt{29}}{2}\right)^{12} + \left(\frac{5-\sqrt{29}}{2}\right)^{12}\right\}.$$

we have that:

(((24591257728-e^(Pi*sqrt58)+24)))/(((e^(-Pi*sqrt58))))

Input:

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}}$$

Exact result:

$$e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right)$$

Decimal approximation:

4372.000003914236555980794948281982456509442860193888738044...

4372.00000391423… ≈ 4372

Property:

$e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right)$ is a transcendental number

Alternate forms:

$$-e^{\sqrt{58}\,\pi}\left(e^{\sqrt{58}\,\pi} - 24591257752\right)$$

$$24591257752\, e^{\sqrt{58}\,\pi} - e^{2\sqrt{58}\,\pi}$$

Series representations:

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} = -e^{\pi\sqrt{57}\sum_{k=0}^{\infty}57^{-k}\binom{1/2}{k}}\left(-24591257752 + e^{\pi\sqrt{57}\sum_{k=0}^{\infty}57^{-k}\binom{1/2}{k}}\right)$$

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} = -e^{\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}\left(-24591257752 + e^{\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}}\right)$$

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} = -\exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(58-z_0)^k z_0^{-k}}{k!}\right)\left(-24591257752 + \exp\left(\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(58-z_0)^k z_0^{-k}}{k!}\right)\right)$$

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

From which, subtracting 276, we obtain:

(((24591257728-e^(Pi*sqrt58)+24)))/(((e^(-Pi*sqrt58)))) -276

Input:

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276$$

Exact result:

$$e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right) - 276$$

Decimal approximation:

4096.000003914236555980794948281982456509442860193888738044...

4096.00000391423… ≈ 4096

Property:

$-276 + e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right)$ is a transcendental number

Alternate forms:

$$-276 - e^{\sqrt{58}\,\pi}\left(e^{\sqrt{58}\,\pi} - 24591257752\right)$$

$$-276 + 24591257752\, e^{\sqrt{58}\,\pi} - e^{2\sqrt{58}\,\pi}$$

Series representations:

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276 = -276 + 24591257752\, e^{\pi\sqrt{57}\sum_{k=0}^{\infty}57^{-k}\binom{1/2}{k}} - e^{2\pi\sqrt{57}\sum_{k=0}^{\infty}57^{-k}\binom{1/2}{k}}$$

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276 =$$

$$-276 + 24591257752\, e^{\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}} - \exp\left(2\pi\sqrt{57}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{57}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276 =$$

$$-276 + 24591257752\exp\left(\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 57^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right) -$$
$$\exp\left(\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 57^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{\sqrt{\pi}}\right)$$

Also here we have the following mathematical connection:

$$\left[\sqrt{\sqrt{2} + \left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right) - 3\right)^2}\right] = 4096.2312989\ldots \approx 4096$$

$$\left[e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right) - 276\right] = 4096.00000391423\ldots \approx 4096$$

And again:

sqrt(((((sqrt2+[((((ln((((exp((sqrt3)/2) *1/ (((((([sin(((Pi/2))/2*sqrt(3-1))]))))^(1/(1+sqrt3)) * ((([cos(((Pi/2))/2*sqrt(3-1))])))^(1/(sqrt3-1)))))))))))^6-3)]^2)))))

Input:

$$\sqrt{\sqrt{2}+\left(\log^6\left(\exp\left(\frac{\sqrt{3}}{2}\right)\times\frac{1}{\sqrt[1+\sqrt{3}]{\sin\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}\sqrt[\sqrt{3}-1]{\cos\left(\frac{\frac{\pi}{2}}{2}\sqrt{3-1}\right)}}\right)-3\right)^2}$$

log(x) is the natural logarithm

Exact result:

$$\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2}$$

Decimal approximation:

64.00180699721337156767406756344866072623585079155898822769...

64.0018069972…..≈ 64

Alternate forms:

$$\sqrt{\left(\sqrt{2}+\left(3-\frac{1}{64}\left(\sqrt{3}\left(\log\left(\sin\left(\frac{\pi}{2\sqrt{2}}\right)\right)-1\right)+\sqrt{3}\log\left(\cos\left(\frac{\pi}{2\sqrt{2}}\right)\right)+\log\left(\cot\left(\frac{\pi}{2\sqrt{2}}\right)\right)\right)^6\right)^2\right)}$$

$$\sqrt{\left(\sqrt{2}+\left(-3+\log^6\left(2^{1/(\sqrt{3}-1)+1/(1+\sqrt{3})}e^{\sqrt{3}/2}\left(i\left(e^{-(i\pi)/(2\sqrt{2})}-e^{(i\pi)/(2\sqrt{2})}\right)\right)^{-1/(1+\sqrt{3})}\left(e^{-(i\pi)/(2\sqrt{2})}+e^{(i\pi)/(2\sqrt{2})}\right)^{-1/(\sqrt{3}-1)}\right)\right)^2\right)}$$

cot(x) is the cotangent function

All 2nd roots of sqrt(2) + (log^6(e^(sqrt(3)/2) sin^(-1/(1 + sqrt(3)))(π/(2 sqrt(2))) cos^(-1/(sqrt(3) - 1))(π/(2 sqrt(2)))) - 3)^2:

Hide trigonometric form

$$e^0\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2}=$$

$$\cos(0)\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2}+$$

$$i\sin(0)\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2}$$

≈64.0 (real, principal root)

$$e^{i\pi}\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2} =$$

$$\cos(\pi)\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2} +$$

$$i\sin(\pi)\sqrt{\sqrt{2}+\left(\log^6\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^2}$$

≈ -64.0 (real root)

and:

sqrt((((((24591257728-e^(Pi*sqrt58)+24)))/(((e^(-Pi*sqrt58)))) -276)))

Input:

$$\sqrt{\frac{24591257728-e^{\pi\sqrt{58}}+24}{e^{-\pi\sqrt{58}}}-276}$$

Exact result:

$$\sqrt{e^{\sqrt{58}\,\pi}\left(24591257752-e^{\sqrt{58}\,\pi}\right)-276}$$

Decimal approximation:

64.000000030579973086294220268152371854300358016598120011 16...

64.00000003057997….≈ 64

Property:

$\sqrt{-276+e^{\sqrt{58}\,\pi}\left(24591257752-e^{\sqrt{58}\,\pi}\right)}$ is a transcendental number

Alternate form:

$$\sqrt{-276-e^{\sqrt{58}\,\pi}\left(e^{\sqrt{58}\,\pi}-24591257752\right)}$$

All 2nd roots of e^(sqrt(58) π) (24591257752 - e^(sqrt(58) π)) - 276:

$$\sqrt{e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right) - 276}\; e^{0} \approx 0 \quad \text{(real, principal root)}$$

$$\sqrt{e^{\sqrt{58}\,\pi}\left(24591257752 - e^{\sqrt{58}\,\pi}\right) - 276}\; e^{i\pi} \approx 0 \quad \text{(real root)}$$

Series representations:

$$\sqrt{\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276} = \sqrt{-277 + 24591257752\, e^{\pi\sqrt{58}} - e^{2\pi\sqrt{58}}}\; \sum_{k=0}^{\infty} \left(-277 + 24591257752\, e^{\pi\sqrt{58}} - e^{2\pi\sqrt{58}}\right)^{-k} \binom{\frac{1}{2}}{k}$$

$$\sqrt{\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276} = \sqrt{-277 + 24591257752\, e^{\pi\sqrt{58}} - e^{2\pi\sqrt{58}}}\; \sum_{k=0}^{\infty} \frac{(-1)^k \left(-277 + 24591257752\, e^{\pi\sqrt{58}} - e^{2\pi\sqrt{58}}\right)^{-k} \left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{\frac{24591257728 - e^{\pi\sqrt{58}} + 24}{e^{-\pi\sqrt{58}}} - 276} = \sqrt{z_0}\, \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(-276 + 24591257752\, e^{\pi\sqrt{58}} - e^{2\pi\sqrt{58}} - z_0\right)^k z_0^{-k}}{k!}$$

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

Thence, the following mathematical connection:

$$\left[\sqrt{\sqrt{2}+\left(\log^{6}\left(e^{\sqrt{3}/2}\sin^{-1/(1+\sqrt{3})}\left(\frac{\pi}{2\sqrt{2}}\right)\cos^{-1/(\sqrt{3}-1)}\left(\frac{\pi}{2\sqrt{2}}\right)\right)-3\right)^{2}}\right] = 64.0018069\ldots..$$

$$\left[\sqrt{e^{\sqrt{58}\,\pi}\left(24591257752-e^{\sqrt{58}\,\pi}\right)-276}\right] = 64.00000003057997\ldots.$$

Appendix - Vacuum Geometry

From:

GEM Technologies

22 aprile alle ore 22:17 ·

Jain 108 Academy

22 aprile alle ore 22:00 ·

DODECAHEDRAL LANGUAGE OF LIGHT

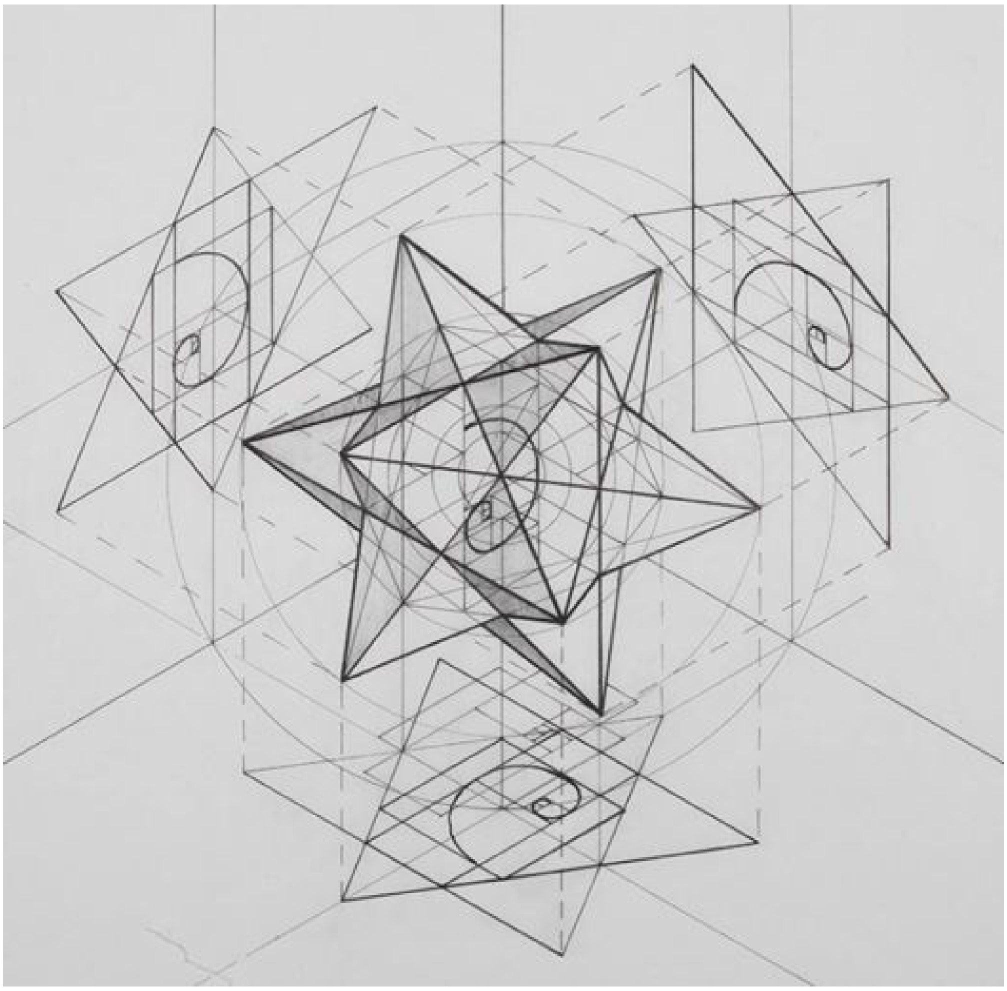
Shape stores Memory, like crystals. The ultimate shape that embodies the Phi Code is the Dodecahedron. Having 12 pentagonal faces, 20 vertices and 30 edges, it is the 3-dim form of the 2-dim Pentacle or 5 point star, that defines the shape of all your proteins.

When this Dodecahedron is stellated (made into a Star) it reaches a hyper dimensional state, such that when focussed light or laser beams are shined upon it, it reveals a panoply of intelligent shadow forms called the Language of Light, the a, b,c, the 1, 2 and 3.

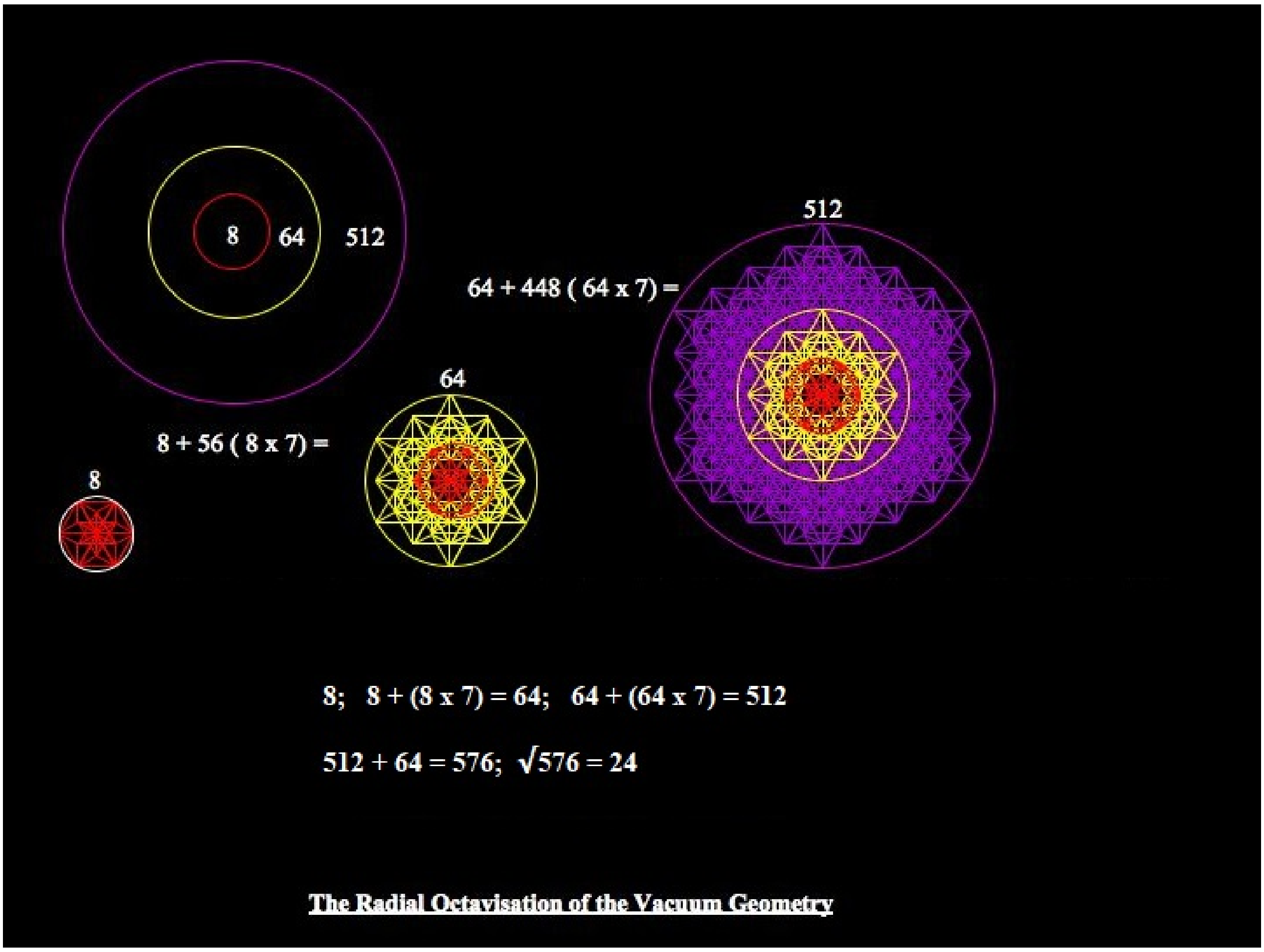
Our living DNA molecules reveal the same constituent shapes carried within the genetic code. If a chemist was to inspect these nucleic acid/proteins, she/he would see two dimensional platelets of two fused pairs of hexagons and pentagons ..

What is interesting here is the mathematics of the rectangle linking the hexagons. It is not just any rectangle. It is the Golden Phi Rectangle, in fact there are 3 Phi Rectangles that act as axes, the invisible skeletal structure that lives inside the Dodecahedron.

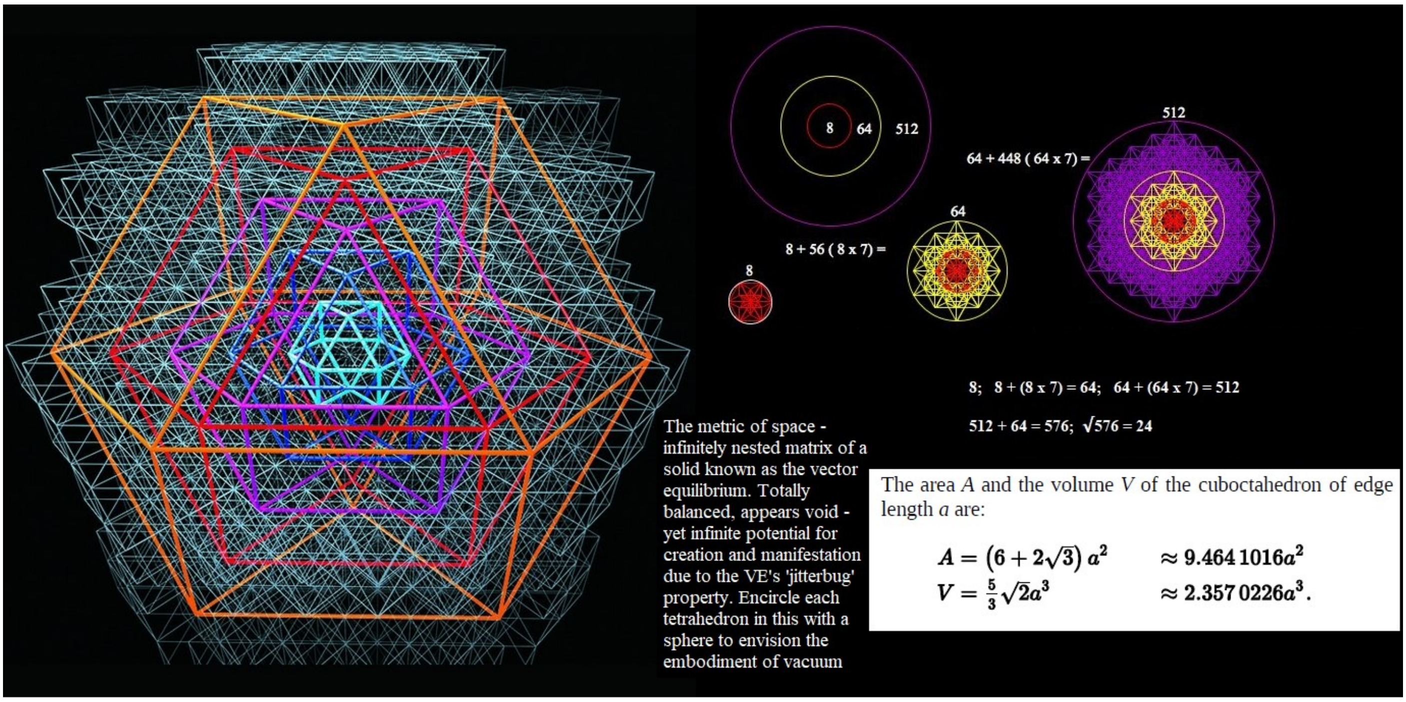
Image: Rafael Araujo



https://www.pinterest.it/pin/570338740293422619/



https://imgur.com/r/holofractal/6YwLRqH



In geometry, a **cuboctahedron** is a polyhedron with 8 triangular faces and 6 square faces. A cuboctahedron has 12 identical vertices, with 2 triangles and 2 squares meeting at each, and 24 identical edges, each separating a triangle from a square. As such, it is a quasiregular polyhedron, i.e. an Archimedean solid that is not only vertex-transitive but also edge-transitive. It is the only radially equilateral convex polyhedron.

With regard the cuboctahedron, we have the following formulas concerning Area and Volume:

The area A and the volume V of the cuboctahedron of edge length a are:

$$A = \left(6 + 2\sqrt{3}\right) a^2 \approx 9.4641016 a^2$$
$$V = \frac{5}{3}\sqrt{2} a^3 \approx 2.3570226 a^3.$$

Now, we observe that the radius of the sphere circumscribed to the cube is equal to:

$$\frac{\sqrt{3}}{2}L$$

while the radius of the sphere inscribed to the octahedron is equal to:

$$\frac{\sqrt{6}}{6}L$$

From the volume formula, for *a* equal to the radius of the sphere circumscribed to the cube, for L = 1.01861677, we obtain:

(5/3*sqrt2)*(((sqrt3)/2)*1.01861677)^3

Input interpretation:

$$\left(\frac{5}{3}\sqrt{2}\right)\left(\frac{\sqrt{3}}{2}\times 1.01861677\right)^3$$

Result:

1.61803573...

1.61803573…

From the area formula, for *a* equal to the radius of the sphere inscribed to the octahedron, for L = 1.01281, we obtain:

(6+2sqrt3)*(((sqrt6)/6)*1.01281)^2

Input interpretation:

$$\left(6+2\sqrt{3}\right)\left(\frac{\sqrt{6}}{6}\times 1.01281\right)^2$$

Result:

1.61802...

1.6180208201…

We note that the two solutions are very good approximations to the value of golden ratio

Furthermore, we have that:

(2/15(sqrt(6)+sqrt(30)))^(1/3)

Input:

$$\sqrt[3]{\frac{2}{15}\left(\sqrt{6}+\sqrt{30}\right)}$$

Decimal approximation:

1.018616404103200144587062791626378585000264771994675875913...

1.01861…

sqrt((3/2 + (3 sqrt(5))/2)/(3 + sqrt(3)))

Input:

$$\sqrt{\frac{\frac{3}{2}+\frac{1}{2}\left(3\sqrt{5}\right)}{3+\sqrt{3}}}$$

Result:

$$\sqrt{\frac{\frac{3}{2}+\frac{3\sqrt{5}}{2}}{3+\sqrt{3}}}$$

Decimal approximation:

1.012814121485659740517350533991522483035419937772355098246...

1.01281…

Thence, in conclusion, we obtain the following equations:

a)

(5/3*sqrt2)*(((sqrt3)/2)*((2/15(sqrt(6)+sqrt(30)))^(1/3))))^3

Input:

$$\left(\frac{5}{3}\sqrt{2}\right)\left(\frac{\sqrt{3}}{2}\sqrt[3]{\frac{2}{15}\left(\sqrt{6}+\sqrt{30}\right)}\right)^3$$

Exact result:

$$\frac{\sqrt{6}+\sqrt{30}}{2\sqrt{6}}$$

Decimal approximation:

1.6180339887498948482045868343656381177203091798057628621354...

1.6180339887…

Alternate forms:

$$\frac{1}{2}\left(1+\sqrt{5}\right)$$

$$\frac{1}{2}+\frac{\sqrt{5}}{2}$$

$$\frac{\sqrt{5}}{2}+\frac{1}{2}$$

Minimal polynomial:

$$x^2-x-1$$

b)

(6+2sqrt3)*(((sqrt6)/6)*(sqrt((3/2+(3sqrt(5))/2)/(3+sqrt(3)))))^2

Input:

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

Result:

$$\frac{(6+2\sqrt{3})\left(\frac{3}{2}+\frac{3\sqrt{5}}{2}\right)}{6(3+\sqrt{3})}$$

Decimal approximation:

1.6180339887498948482045868343656381177203091798057628621354...

1.6180339887…

Alternate forms:

$$\frac{1}{2}\left(1+\sqrt{5}\right)$$

$$\frac{1}{2}+\frac{\sqrt{5}}{2}$$

$$\frac{\sqrt{5}}{2}+\frac{1}{2}$$

Minimal polynomial:

x^2-x-1

We have that the two results are precisely equal to the value of golden ratio

Now, from the following Ramanujan expression:

$$g_{126} = \sqrt{\left(\frac{\sqrt{3}+\sqrt{7}}{2}\right)}(\sqrt{6}+\sqrt{7})^{\frac{1}{6}}\left\{\sqrt{\left(\frac{3+\sqrt{2}}{4}\right)}+\sqrt{\left(\frac{\sqrt{2}-1}{4}\right)}\right\}^2,$$

We obtain:

sqrt(((sqrt3+sqrt7)/2)) * (sqrt6+sqrt7)^(1/6) * [((sqrt(((3+(sqrt2))/4)))+sqrt(((((sqrt2)-1))/4)))]^2

Input:

$$\sqrt{\frac{1}{2}\left(\sqrt{3}+\sqrt{7}\right)}\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\sqrt{\frac{1}{4}\left(3+\sqrt{2}\right)}+\sqrt{\frac{1}{4}\left(\sqrt{2}-1\right)}\right)^2$$

Result:

$$\sqrt{\frac{1}{2}\left(\sqrt{3}+\sqrt{7}\right)}\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\frac{1}{2}\sqrt{\sqrt{2}-1}+\frac{\sqrt{3+\sqrt{2}}}{2}\right)^2$$

Decimal approximation:

3.654863055109063986634690287660477433664447716051079194506...

3.65486305510906…..

or:

sqrt(((sqrt3)/2+(sqrt7)/2)) * (sqrt6+sqrt7)^(1/6) * [((sqrt(3/4+(sqrt2)/4)+sqrt(((sqrt2)/4)-1/4)))]^2

Input:

$$\sqrt{\frac{\sqrt{3}}{2}+\frac{\sqrt{7}}{2}}\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\sqrt{\frac{3}{4}+\frac{\sqrt{2}}{4}}+\sqrt{\frac{\sqrt{2}}{4}-\frac{1}{4}}\right)^2$$

Result:

$$\sqrt{\frac{\sqrt{3}}{2}+\frac{\sqrt{7}}{2}}\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\sqrt{\frac{1}{2\sqrt{2}}-\frac{1}{4}}+\sqrt{\frac{3}{4}+\frac{1}{2\sqrt{2}}}\right)^2$$

Decimal approximation:

3.654863055109063986634690287660477433664447716051079194506...

3.65486305510906…..

Alternate forms:

$$\frac{1}{8}\sqrt{\left(\sqrt{3}+\sqrt{7}\right)2}\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\sqrt{\sqrt{2}-1}+\sqrt{3+\sqrt{2}}\right)^2$$

$$\frac{\sqrt{\sqrt{3}+\sqrt{7}}\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(1+\sqrt{2}+\sqrt{2\sqrt{2}-1}\right)}{2\sqrt{2}}$$

$$\sqrt[6]{\text{root of } x^8-2384x^7+1044x^6-6256x^5+15974x^4-6256x^3+1044x^2-2384x+1 \text{ near } x=2383.56}$$

Minimal polynomial:

$$x^{48} - 2384x^{42} + 1044x^{36} - 6256x^{30} + 15974x^{24} - 6256x^{18} + 1044x^{12} - 2384x^{6} + 1$$

From which:

(sqrt3)/2 = ((((3.654863055109 / ((((sqrt6+sqrt7)^(1/6) * [((sqrt(3/4+(sqrt2)/4)+sqrt(((sqrt2)/4)-1/4)))]^2)))))))^2 - (sqrt7)/2

Input interpretation:

$$\frac{\sqrt{3}}{2} = \left(\frac{3.654863055109}{\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\sqrt{\frac{3}{4}+\frac{\sqrt{2}}{4}}+\sqrt{\frac{\sqrt{2}}{4}-\frac{1}{4}}\right)^2}\right)^2 - \frac{\sqrt{7}}{2}$$

Thence, from the previous expression, we obtain:

(5/3*sqrt2)*(((((((((3.654863055109 / ((((sqrt6+sqrt7)^(1/6) * ((([((sqrt(3/4+(sqrt2)/4)+sqrt(((sqrt2)/4)-1/4)))]^2)))))))^2 - (sqrt7)/2))*((2/15(sqrt(6)+sqrt(30)))^(1/3))))))))^3

Input interpretation:

$$\left(\frac{5}{3}\sqrt{2}\right)\left(\left(\left(\frac{3.654863055109}{\sqrt[6]{\sqrt{6}+\sqrt{7}}\left(\sqrt{\frac{3}{4}+\frac{\sqrt{2}}{4}}+\sqrt{\frac{\sqrt{2}}{4}-\frac{1}{4}}\right)^2}\right)^2 - \frac{\sqrt{7}}{2}\right)\sqrt[3]{\frac{2}{15}\left(\sqrt{6}+\sqrt{30}\right)}\right)^3$$

Result:

1.61803398875...

1.61803398875…..

Input interpretation:

1.61803398875

1.61803398875

Rational approximation:

$$\frac{832040}{514229} = 1 + \frac{317811}{514229}$$

Possible closed forms:

$\phi \approx 1.61803398874989$

$\Phi + 1 \approx 1.61803398874989$

$\frac{1}{\Phi} \approx 1.61803398874989$

Conclusion

From what we have described in this appendix, it is possible and plausible that the vacuum geometry is strongly connected to the value of the golden ratio and that Ramanujan's mathematics, especially that described in paragraph 5 of the wonderful paper "Modular equations and approximations to π ", is strictly connected to the quantum gravity and the vacuum geometry, precisely to the mathematical development of this theory

Observations

Figs.

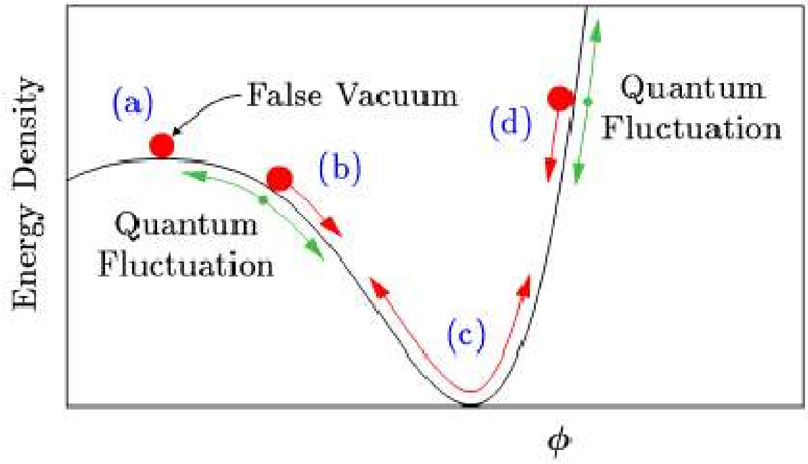
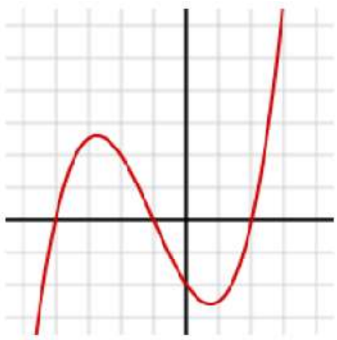


FIG. 1: In simple inflationary models, the universe at early times is dominated by the potential energy density of a scalar field, ϕ. Red arrows show the classical motion of ϕ. When ϕ is near region (a), the energy density will remain nearly constant, $\rho \cong \rho_f$, even as the universe expands.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



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

The ratio between M_0 and q

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

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

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

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

1.732050787905194420703947625671018160083566548802082460520...

1.7320507879

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

We note that:

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

i is the imaginary unit

$i\sqrt{3}$

1.7320508075688772935274463415058723669428052538103806280558... i

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

1.73205

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

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

We have that the previous result

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

$$= 1.7320508075688772935274463415058723669428052538103806280 55\ldots i$$

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

can be related with:

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

Considering:

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

$$= i\sqrt{3} = 1.732050807568877293527446341505872366942805253810380628055\ldots i$$

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

Thence:

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

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

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

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

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

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

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

From Wikipedia

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

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

Note that:

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

Hence

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

so that

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

Hence

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

Thence:

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

And

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

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

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

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

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

Fibonacci numbers are also closely related to Lucas numbers ,in that the Fibonacci and Lucas numbers form a complementary pair of Lucas sequences

The beginning of the sequence is thus:

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

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

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

The sequence of Lucas numbers is:

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

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

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

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

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

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

In conclusion we obtain also many results that are very good approximations to the value of the golden ratio 1.618033988749...

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