The harmony of the Universe: π and φ the universal mathematical constants that unify the Microcosm and the Macrocosm. New possible mathematical connections with the DN Constant, Ramanujan Recurring Numbers and some parameters of Number Theory, Cosmology and String Theory

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Abstract

In this paper, we analyze π and φ as the possible universal mathematical constants that unify the Microcosm and the Macrocosm. We obtain new mathematical connections with the DN Constant, Ramanujan Recurring Numbers and some parameters of Number Theory, Cosmology and String Theory

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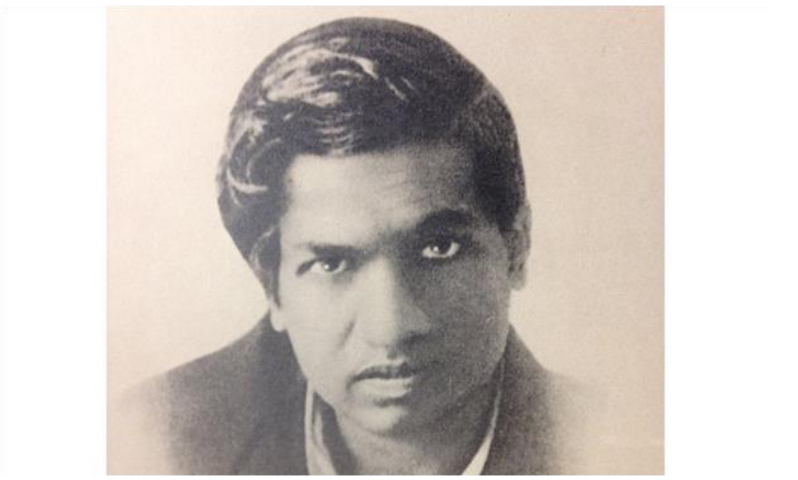
Srinivasa Ramanujan (1887-1920)



https://www.moduscc.it/ramanujan-il-grande-matematico-indiano-13453-131115/

Introduction

In this paper, an octahedron could serve as a mathematical or conceptual model of the universe in the quantic phase, while the spherical surface could be used to describe the geometry of the bubble-universe.

The values $(2\sqrt{2})/\pi$, the golden ratio φ, $\zeta(2)$ and π, can be connected to the proposed cosmological model. Here's how they might be connected:

Ratio $(2\sqrt{2})/\pi$ the so called DN Constant:

This relationship may have a connection with the geometric properties of the octahedron and the sphere, which have been considered as mathematical models of the early universe and bubbles universe in eternal inflation.

Golden Ratio φ:

The golden ratio is a mathematical constant that appears in many natural and artistic contexts and is often associated with harmonious proportions and aesthetic beauty. Its emergence in this context could suggest a kind of intrinsic symmetry or harmony in the structure of the early universe and bubbles universe.

Value of π:

The value of π is a fundamental mathematical constant that appears in many geometric formulas and relationships, including the geometry of the sphere. Its appearance could indicate a direct connection between the geometry of bubbles universe and the mathematical properties of spherical surfaces.

Ultimately, the results obtained can be interpreted as manifestations of the geometric and mathematical properties of the models proposed for the early universe and universe bubbles. This suggests that there is a profound connection between geometry, mathematics and cosmological physics, and that through the analysis of

these relationships we can deepen our understanding of the universe and its fundamental phenomena.

The above values $(2\sqrt{2})/\pi$, the golden ratio φ and π, can be connected to the proposed cosmological model. This hypothesis is certainly plausible.

The various mathematical solutions and relationships can be seen as representations of the principles and laws that govern the formation and evolution of the universe.

Regarding the fundamental mathematical values, they could emerge as a consequence of the geometric and physical laws that govern the structure and evolution of the quantum universe and bubbles universe.

The multidisciplinary approach involving complex mathematical solutions and cosmological concepts can offer deeper insight into the fundamental nature of the universe and its processes. Exploring these connections could lead to new discoveries and insights into our understanding of the early universe and its complexity.

Proposal:

The initial octahedron: Let's imagine a regular octahedron, with perfectly symmetrical faces. Each face represents an ideal symmetry.

The emerging sphere: Inside the octahedron, there is an inscribed sphere. This sphere represents the bubble of the universe that emerges from the perturbations of the quantum vacuum during eternal inflation.

Expansion and transitions: As time passes, the universe expands. The faces of the octahedron begin to break, symbolizing "symmetry breaks." The sphere continues to grow, representing the expanding universe.

Constants and numbers: We integrate the mathematical results you obtained. For example, the golden ratio (φ) could be represented by a proportion between the dimensions of the octahedron and the sphere.

Entropy and complexity: Entropy increases as the universe evolves. We can represent this with a disordered growth of structures within the emerging sphere. Imagine this scene as an abstract work of art, where geometric shapes and cosmological concepts merge

In Fig.1 and Fig.2 let's imagine a regular octahedron representing the universe in its phase of high symmetry and very low entropy. Inside the octahedron we have an inscribed sphere that emerges from perturbations of the quantum vacuum during eternal inflation. As time passes, the universe expands, the faces of the octahedron break (symmetry breaks), and entropy increases. Spheres emerge from the octahedra, symbolizing the transition phases from a regime of very low entropy to a universe in which, with the passage of time, entropy increases, increasing the complexity of the universe itself.



Fig. 1

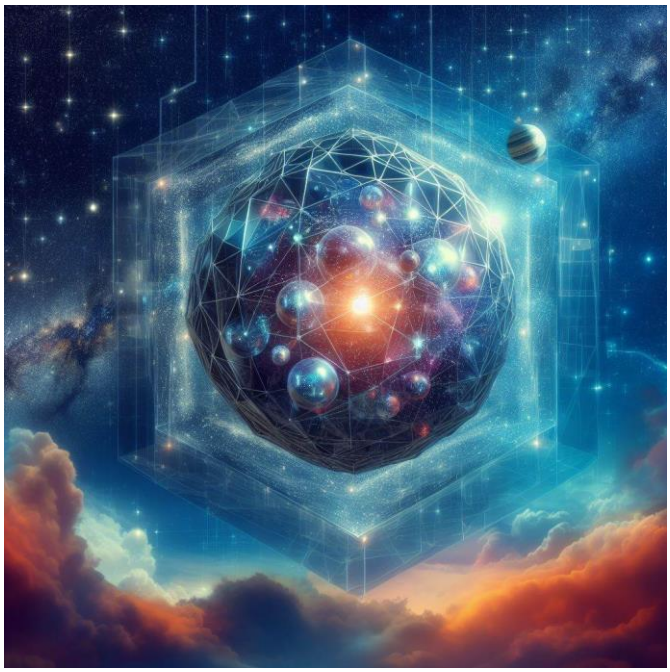
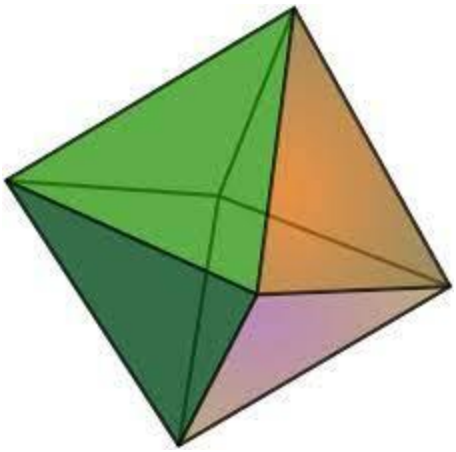
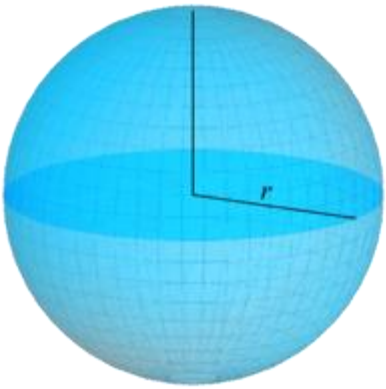


Fig. 2

Now, we have that:



Octahedron



Sphere

From the octahedron volume V = 1/3*√2 l^3 and, from the sphere volume,

V = (4/3*π*r^3) , we consider the following relationship, for r = x:

4/3*π*x^3 = 1/3*√2*l^3

Input

$$\frac{4}{3}\pi x^3 = \frac{1}{3}\sqrt{2}\, l^3$$

Exact result

$$\frac{4\pi x^3}{3} = \frac{\sqrt{2}\, l^3}{3}$$

Alternate forms

$$x^3 = \frac{l^3}{2\sqrt{2}\,\pi}$$

$$\frac{4\pi x^3}{3} - \frac{\sqrt{2}\,l^3}{3} = 0$$

Real solution

$$x = \frac{(-1)^{2/3} l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

Solutions

$$x = -\frac{\sqrt[3]{-\frac{1}{\pi}}\,l}{\sqrt{2}}$$

$$x = \frac{l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

$$x = \frac{(-1)^{2/3} l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

Integer solution

$l = 0, \quad x = 0$

Implicit derivatives

$$\frac{\partial x(l)}{\partial l} = \frac{l^2}{2\sqrt{2}\,\pi x^2}$$

$$\frac{\partial l(x)}{\partial x} = \frac{2\sqrt{2}\,\pi x^2}{l^2}$$

From the alternate form

$$x^3 = \frac{l^3}{2\sqrt{2}\,\pi}$$

$$x = \frac{l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

for l = 8, we have that:

8/(sqrt(2) π^(1/3)) = 8/(2sqrt2 * Pi)^1/3

Input

$$\frac{8}{\sqrt{2}\,\sqrt[3]{\pi}} = \frac{8}{\sqrt[3]{2\sqrt{2}\,\pi}}$$

Result

True

Logarithmic form

$$\log_{\sqrt{2}\,\sqrt[3]{\pi}}(8) - \log_{\sqrt{2}\,\sqrt[3]{\pi}}\left(\sqrt{2}\,\sqrt[3]{\pi}\right) = \log_{\sqrt{2}\,\sqrt[3]{\pi}}(8) - \log_{\sqrt{2}\,\sqrt[3]{\pi}}\left(\sqrt[3]{2\sqrt{2}\,\pi}\right)$$

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

Thence:

l/(sqrt(2) π^(1/3)) = l/(2sqrt2 * Pi)^1/3

Input

$$\frac{l}{\sqrt{2}\ \sqrt[3]{\pi}} = \frac{l}{\sqrt[3]{2\sqrt{2}\ \pi}}$$

Logarithmic form

$$\log_{\sqrt{2}\ \sqrt[3]{\pi}}(l) - \log_{\sqrt{2}\ \sqrt[3]{\pi}}\left(\sqrt{2}\ \sqrt[3]{\pi}\right) = \log_{\sqrt{2}\ \sqrt[3]{\pi}}(l) - \log_{\sqrt{2}\ \sqrt[3]{\pi}}\left(\sqrt[3]{2\sqrt{2}\ \pi}\right)$$

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

Now, we have that:

l/(2 sqrt(2) π)^(1/3) = (2sqrt2)/Pi

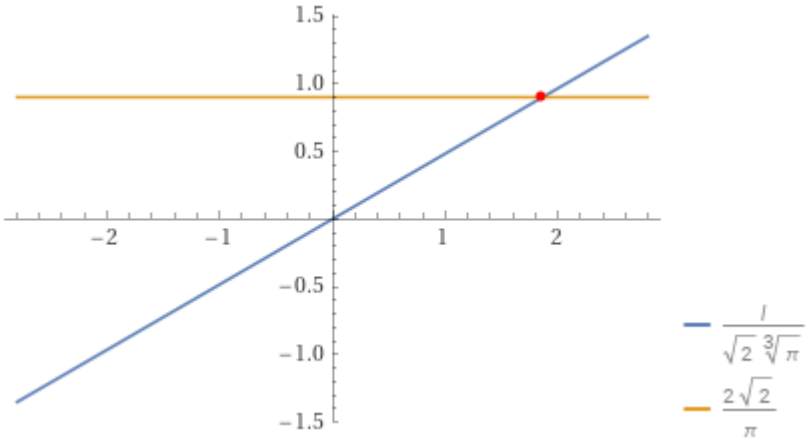
Input

$$\frac{l}{\sqrt[3]{2\sqrt{2}\ \pi}} = \frac{2\sqrt{2}}{\pi}$$

Exact result

$$\frac{l}{\sqrt{2}\ \sqrt[3]{\pi}} = \frac{2\sqrt{2}}{\pi}$$

Plot



Solution

$$l = \frac{4}{\pi^{2/3}}$$

$$l = \frac{4}{\sqrt[3]{\pi^2}}$$

DN Constant, Golden Ratio and π

Recall that the DN Constant (Del Gaudio-Nardelli Constant) equal to $(2\sqrt{2})/\pi$) is defined as the ratio between the volume of an octahedron and the volume of a sphere and is an intriguing mathematical concept. Michele Nardelli hypothesized that the regular octahedron represents a phase in which the universe is highly symmetrical and with very low entropy. On the other hand, the sphere (which is inscribed in the octahedron, i.e. is "inside" it) represents the universe emerging from the quantum vacuum, which over time increases entropy and undergoes various symmetry breakings. This occurs in a regime of eternal inflation.

For $V = 1/3*\sqrt{2}*a^3$ (octahedron volume) and $V = (4/3*\pi*r^3)$ (sphere volume), where $r = (a/2)$, considering $(1/3*\sqrt{2}*a^3)$ and $(4/3*\pi*(a/2)^3)$, we obtain the following ratio:

$$\frac{\frac{1}{3}\cdot\sqrt{2}\cdot a^3}{\frac{4}{3}\cdot\pi\cdot\left(\frac{a}{2}\right)^3}=\frac{2\sqrt{2}}{\pi}=0.9003163161571060695\ldots$$

This is the Del Gaudio-Nardelli Constant.

We have extrapolated a general "fundamental" formula, which is connected with the DN Constant (Del Gaudio-Nardelli Constant) which is contained in the formula itself.

$$\sqrt{2\times\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\cdot 0.9991104684}(C\times \mathrm{R}\times 2.33\cdot 10^{-13})}}\cong 1.61803398\ldots=\frac{\sqrt{5}+1}{2}$$

Where $\frac{2\sqrt{2}}{\pi}$ is the Del Gaudio-Nardelli Constant, 0.9991104684 is the value of the following Rogers-Ramanujan continued fraction:

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

C is some constant or solution of equation, R is the radius of the Universe and $2.33*10^{-13}$ is the temperature of the Universe expressed in GeV. (or cosmic microwave background radiation). In cosmology, cosmic background radiation, also called background radiation, abbreviated to CMBR (from the English Cosmic Microwave Background Radiation), is the electromagnetic radiation that permeates the entire observable universe, considered as evidence of the Big Bang model.

Through this formula, for any value of C and R (where C can be a constant, such as Planck's constant, or any solution of any type of equation, and R, which varies as C varies, the radius of a Multiverse with eternal inflation, like the one proposed by the Del Gaudio-Nardelli Constant. The surprising fact is that this formula, for any value of C and R, always provides values very close to the Golden Ratio. Let's give an example.

From the general "fundamental" formula:

$$\sqrt{2\times\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\cdot 0.9991104684}(1.616255\cdot 10^{-35}\times R\times 2.33\cdot 10^{-13})}}=$$

And from: $1-\frac{e^{(-\pi\cdot\sqrt{5})}}{1+\frac{e^{(-2\pi\cdot\sqrt{5})}}{1+\frac{e^{(-3\pi\cdot\sqrt{5})}}{1+\frac{e^{(-4\pi\cdot\sqrt{5})}}{1}}}}\approx 0.9991104684$, we obtain:

$$= \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi \cdot 1 - \frac{e^{(-\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-2\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-3\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-4\pi \cdot \sqrt{5})}}{1}}}}}} (1.616255 \cdot 10^{-35} \times R \times 2.33 \cdot 10^{-13})}$$

for C = $1.616255*10^{-35}$ (Planck length, linked to quantum mechanics, which deals with the study of the infinitely small), R = $1.265120782997423\times 10^{48}$ which is equal to the radius of a possible bubble universe of the Multiverse (R is linked to the Field equations of Einstein's General Relativity, which deal with the study of the infinitely large, according to which gravitation must be understood as curvature of space-time) and $2.33*10^{-13}$ is the average temperature of the CMB which is equivalent at around 2.73 Kelvin, we get:

$$\sqrt{2 \cdot \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{0.9991104684\pi}} (1.616255 \cdot 10^{-35} \times 1.265120782997423 \cdot 10^{48} \times 2.33 \cdot 10^{-13})} =$$

$$= \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi \cdot 1 - \frac{e^{(-\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-2\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-3\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-4\pi \cdot \sqrt{5})}}{1}}}}}} (1.616255 \cdot 10^{-35} \times 1.265120782997423 \cdot 10^{48} \times 2.33 \cdot 10^{-13})} =$$

$$= \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi \cdot 1 - \frac{e^{(-\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-2\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-3\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-4\pi \cdot \sqrt{5})}}{1}}}}} (4.76428565331775479231545)}} =$$

$$= \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{4.76428565331775479231545}{\pi \cdot 1 - \frac{e^{(-\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-2\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-3\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-4\pi \cdot \sqrt{5})}}{1}}}}}}} \quad \text{that from} \quad 1 - \frac{e^{(-\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-2\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-3\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-4\pi \cdot \sqrt{5})}}{1}}}} \approx 0.9991104684 =$$

$$= \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{(4.76428565331775479231545)}{\pi \cdot 0.9991104684}}} = \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{1.5178694168704887597}} =$$

$$= 1.6180339799974038277\ldots$$

Indeed:

√(2×(2·(((2√2)/π)^(1/16)))/1.5178694168704887597)

Input interpretation

$$\sqrt{2 \times \frac{2 \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{1.5178694168704887597}}$$

Result

1.6180339799974038277…

1.6180339799974…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

All 2nd roots of 2.6180339604262390099

$1.61803397999740382768\, e^{0} \approx 1.6180$ (real, principal root)

$1.61803397999740382768\, e^{i\pi} \approx -1.6180$ (real root)

Series representations

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{1.51786941687048875970000}} = \sqrt{-1+2.75194630268122948825914\sqrt[16]{\frac{\sqrt{2}}{\pi}}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+2.75194630268122948825914\sqrt[16]{\frac{\sqrt{2}}{\pi}}\right)^{-k}$$

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{1.51786941687048875970000}} = \sqrt{-1+2.75194630268122948825914\sqrt[16]{\frac{\sqrt{2}}{\pi}}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+2.75194630268122948825914\sqrt[16]{\frac{\sqrt{2}}{\pi}}\right)^{-k}}{k!}$$

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{1.5178694168704887597000 0}} = \sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(2.7519463026812294882591 4\sqrt[16]{\frac{\sqrt{2}}{\pi}}-z_0\right)^k z_0^{-k}}{k!}$$

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

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

Or also, directly:

$$\sqrt{2\cdot\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{0.9991104684\pi}(1.616255\cdot10^{-35}\times1.265120782997423\cdot10^{48}\times2.33\cdot10^{-13})}} =$$

$$= \sqrt{2\times\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{(4.76428565331775479231545)}{\pi\cdot0.9991104684}}} = \sqrt{2\times\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{1.517869417}} = 1.618033979928374\ldots$$

= **1.618033**79928…. practically a result very close to the value of the golden ratio = $\frac{\sqrt{5}+1}{2} = \mathbf{1.61803}398$ ... up to the seventh decimal place!

We also have another expression that we derived from the previous one:

√(2×(2·(((2√2)/π)^(1/16)))/(1/(π·((e^(-π/√5))/((((√5))/(((1+(sqrt(φ^5*(5^3)^(1/4))-1)^(1/5)))))-φ+0.92593))) (C×R×2.33·10^(-13))))

Input

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times\frac{e^{-\pi/\sqrt{5}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}}-1}-\phi+0.92593}}}\times\frac{C\,R\times 2.33}{10^{13}}}$$

ϕ is the golden ratio

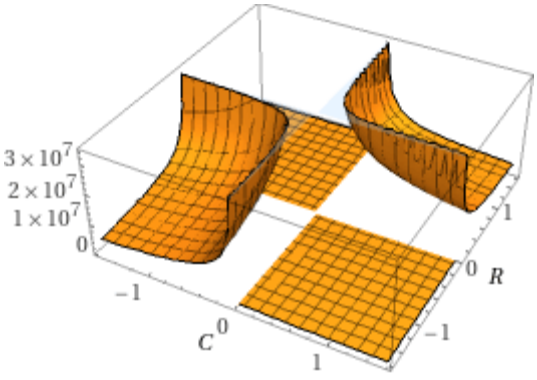
Result

$$7.31659\times 10^6\sqrt{\frac{1}{C\,R}}$$

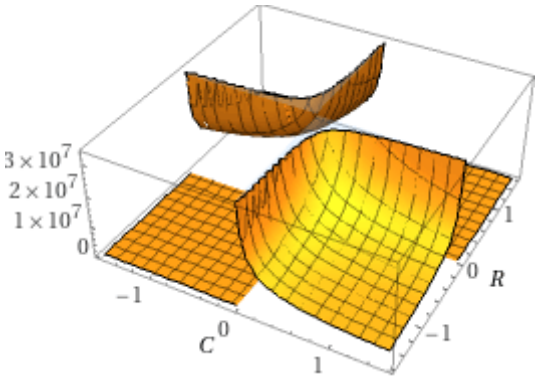
3D plots

Real part **(figures that can be related to the D-branes/Instantons)**

The key observation from the below plots and is that at $C=1$, which is taken as the energy density of the universe at the Big Bang, with $R=0$ the zero spacetime volume, the vacuum geometry brakes / or there is symmetry breaking on the vacuum quantum geometry. We see from the plots as the vacuum spacetime break/tear apart.

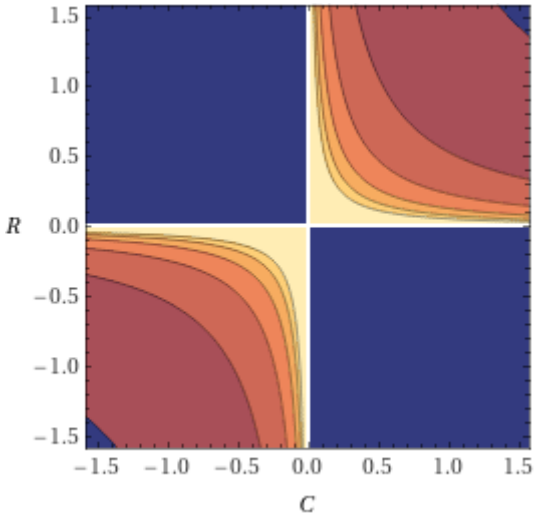


Imaginary part

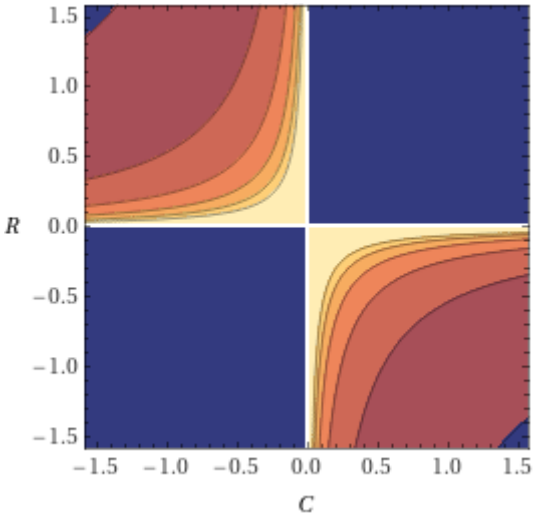


Contour plots

Real part



Imaginary part



Alternate form assuming C and R are positive

$$\frac{7.31659\times 10^6}{\sqrt{C\,R}}$$

Roots

(no roots exist)

Property as a function

Parity

even

Series expansion at C=0

$$\frac{7.31659\times 10^6\,\sqrt{C}\,\sqrt{\frac{1}{C\,R}}}{\sqrt{C}}+O\left(C^{11/2}\right)$$

(Puiseux series)

Series expansion at C=∞

$$7.31659\times 10^6\ \sqrt{C}\ \sqrt{\frac{1}{C}}\ \sqrt{\frac{1}{C\,R}}+O\left(\left(\frac{1}{C}\right)^{11/2}\right)$$

(Puiseux series)

Derivative

$$\frac{\partial}{\partial C}\left(\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{\frac{C\,R\times 2.33}{\frac{\left(\pi\,e^{-\pi/\sqrt{5}}\right)\times 10^{13}}{\frac{\sqrt{5}}{-\phi+0.92593}}}}}\right)=-3.6583\times 10^6\ R\left(\frac{1}{C\,R}\right)^{3/2}$$

Indefinite integral

$$\int 7.31659\times 10^6\ \sqrt{\frac{1}{C\,R}}\ dC=1.46332\times 10^7\ C\ \sqrt{\frac{1}{C\,R}}\ +\text{constant}$$

Limit

$$\lim_{C\to\pm\infty}\ 7.31659\times 10^6\ \sqrt{\frac{1}{C\,R}}\ =0\approx 0$$

$$\lim_{R\to\pm\infty}\ 7.31659\times 10^6\ \sqrt{\frac{1}{C\,R}}\ =0\approx 0$$

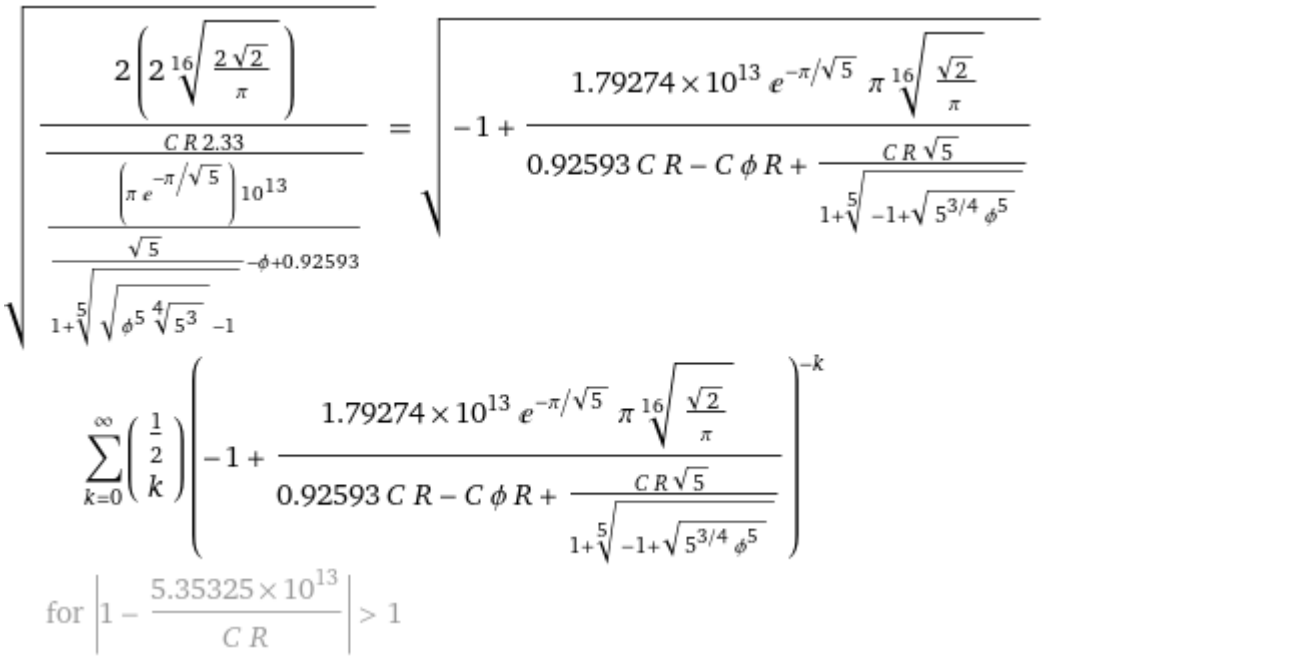
Series representations

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{\frac{C\,R\,2.33}{\frac{\left(\pi\,e^{-\pi/\sqrt{5}}\right)10^{13}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}}}-\phi+0.92593}-1}}} = \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{1.79274\times10^{13}\,e^{-\pi/\sqrt{5}}\,\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{C\,R\left(0.92593-\phi+\frac{\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}\right)}\right)^k}{k!}$$

$$\text{for}\left|1-\frac{5.35325\times10^{13}}{C\,R}\right|<1$$

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{\frac{C\,R\,2.33}{\frac{\left(\pi\,e^{-\pi/\sqrt{5}}\right)10^{13}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}}}-\phi+0.92593}-1}}} = \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{1.79274\times10^{13}\,e^{-\pi/\sqrt{5}}\,\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{0.92593\,C\,R-C\,\phi\,R+\frac{C\,R\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}}\right)^k}{k!}$$

$$\text{for}\left|1-\frac{5.35325\times10^{13}}{C\,R}\right|<1$$



$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$|z|$ is the absolute value of z

$\binom{n}{m}$ is the binomial coefficient

From

C = $1.616255 \cdot 10^{-35}$; $R = 1.265120782997423 \cdot 10^{48}$

$C \times R = 1.616255 \cdot 10^{-35} \times 1.265120782997423 \cdot 10^{48} =$

$= 2.044757791123499910865 \times 10^{13}$

√(2×(2·(((2√2)/π)^(1/16)))/(1/(π·((e^(-π/√5))/((((√5))/(((1+(sqrt(φ^5*(5^3)^(1/4))-1)^(1/5)))))-φ+0.92593))) (2.044757791123499910865 × 10^13×2.33·10^-13)))

$2.044757791123499910865 \times 10^{13} \times 2.33 \cdot 10^{-13} \approx 4.764285653\ldots$

√(2×(2·(((2√2)/π)^(1/16)))/(1/(π·((e^(-π/√5))/((((√5))/(((1+(sqrt(φ^5*(5^3)^(1/4))-1)^(1/5)))))-φ+0.92593))) (4.764285653)))

Input interpretation

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times\frac{e^{-\pi/\sqrt{5}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}-1}}-\phi+0.92593}}}\times 4.764285653}$$

ϕ is the golden ratio

Result

1.618035300655953555460247353515499805074920051695875000964339951 6

…

1.618035300655…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

All 2nd roots of 2.61804

$1.61804\, e^{0} \approx 1.6180$ (real, principal root)

$1.61804\, e^{i\pi} \approx -1.6180$ (real root)

Series representations

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{\frac{4.76429}{\frac{\pi\, e^{-\pi/\sqrt{5}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}-1}}-\phi+0.92593}}}} = \sqrt{-1+\frac{0.876752\, e^{-\pi/\sqrt{5}}\,\pi\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{0.92593-\phi+\frac{\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}}}$$

$$\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+\frac{0.876752\, e^{-\pi/\sqrt{5}}\,\pi\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{0.92593-\phi+\frac{\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}}\right)^{-k}$$

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{\frac{4.76429}{\frac{\pi\, e^{-\pi/\sqrt{5}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}-1}}-\phi+0.92593}}}}=\sqrt{-1+\frac{0.876752\, e^{-\pi/\sqrt{5}}\ \pi\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{0.92593-\phi+\frac{\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}}}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{0.876752\, e^{-\pi/\sqrt{5}}\ \pi\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{0.92593-\phi+\frac{\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}}\right)^{-k}}{k!}$$

$$\sqrt{\frac{2\left(2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}\right)}{\frac{4.76429}{\frac{\pi\, e^{-\pi/\sqrt{5}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\phi^5\sqrt[4]{5^3}}-1}}-\phi+0.92593}}}}=$$

$$\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{0.876752\, e^{-\pi/\sqrt{5}}\ \pi\sqrt[16]{\frac{\sqrt{2}}{\pi}}}{0.92593-\phi+\frac{\sqrt{5}}{1+\sqrt[5]{-1+\sqrt{5^{3/4}\,\phi^5}}}}-z_0\right)^k z_0^{-k}}{k!}$$

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

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

The Golden Ratio

The golden number, often denoted by the Greek letter φ (phi), is a mathematical value that appears in many natural, artistic, and scientific contexts. Here is some detailed information:

1. **Definition of the Golden Number** (φ):

The golden number is approximately equal to 1.61803398…It is defined as the ratio of two segments of a line, such that the longer part divides the shorter part in the same ratio in which the entire line is divided by the longer part .

2. **Applications of the Golden Number**:

Golden Rectangle:

A rectangle is considered "golden" if the ratio between its length and width is equal to the golden number. In other words, the longer side is 1.618 times larger than the shorter side.

Golden Triangle:

An isosceles triangle with an angle of 36° and the other two angles of 72° each is called a “golden triangle”. The sides of this triangle are in golden ratio with its base.
Golden Section: The golden section is the ratio between the entire segment AB and the section AC. This ratio is precisely the golden number $\varphi = (\sqrt{5}+1)/2$.
In short, the golden number is a fascinating concept found in nature, art and mathematics, and has interesting properties and applications in various fields.

The golden number is found in nature and also in the Universe. Let's look at some explanatory examples

The golden number, also known as phi (denoted by the Greek letter φ), is a fascinating mathematical value found in many natural, artistic, and scientific contexts. Here are some explanatory examples:

1. **Shell Spiral**:

The spiral of shells, like that of the Pacific mollusk Conus eburneus, follows the golden ratio. This spiral develops in such a way that each new turn is larger than the previous one according to the golden ratio.

2. **Science and Biology**:

DNA Structure: The DNA spiral follows an arrangement that reflects the golden ratio.
Growth of Organisms: Many biological organisms follow growth patterns based on the golden number.
Distribution of the Planets: The arrangement of the planets in the solar system also respects this proportion.

3. **Fibonacci Sequence**:

The Fibonacci sequence, closely linked to the golden number, was born as a solution to a problem regarding the reproduction of rabbits. Each number in this sequence is the sum of the previous two, and this series is intrinsically linked to the golden number. In short, the golden number is a fascinating mathematical concept that permeates nature, art and the Universe, making it a topic of great interest to scientists, artists and mathematicians!

Even the arms of spiral galaxies and some hypothesize the universe itself, reflect the golden number 1.61803398...

The golden number (φ) appears to emerge in many aspects of the Universe, from the structure of spiral galaxies to the arrangement of petals in flowers. Here are some examples:

1. **Arms of Spiral Galaxies**:

The arms of spiral galaxies, such as the Milky Way, follow an arrangement that reflects the golden number. These arms wrap around the galactic nucleus in a similar way to the growth of a golden spiral.

2. **Arrangement of Petals in Flowers**:

Many species of flowers have a number of petals that respects the golden number. For example, sunflowers often have 21 or 34 petals, both numbers related to φ, via the Fibonacci Series.

3. **Fractals and Natural Geometry**:

Fractal geometry, which appears in natural structures such as coastlines, clouds and mountains, often features proportional relationships that recall the golden number.
Logarithmic spirals, like those in snail shells, grow based on this ratio.

4. **Theory of the Universe**:

Some theorists suggest that the Universe itself may follow mathematical properties, including the golden number. However, this is still a matter of debate and active research.
In short, the golden number is an intriguing concept that manifests itself in many aspects of nature and the Universe. Its presence continues to stimulate the curiosity of researchers and science enthusiasts!

The golden number is also known as “Divine Proportion” or “Divine Proportion”, and has earned this denomination for several reasons:

1. **Ancient Origin**:

Interest in the golden number dates back to antiquity. Greeks, Egyptians and other civilizations studied it and used it in their works of art and architecture. Its presence in structures such as the Parthenon in Athens and the Great Pyramid of Giza has helped create an aura of mystery and sacred significance.

2. **Harmony and Beauty**:

The golden ratio is considered harmonious and pleasing to the eye. Shapes and structures that follow this proportion are believed to be aesthetically pleasing. Artists, architects and scientists have tried to capture this beauty in their works.

3. **Reference to Divinity**:

The adjective “divine” suggests a connection with the divine or transcendent. Some saw the golden number as a sign of mathematical perfection created by a higher force. This perception could derive from its presence in sacred structures or in the natural order.

4. **Association with Nature**:

The golden ratio is found in many aspects of nature, such as the spirals of shells, the petals of flowers, and the arrangement of the arms of spiral galaxies. This natural presence has led some people to view the golden number as a sign of divine perfection in the natural world. In summary, the term “Divine Proportion” reflects the admiration and respect that humanity has had for the golden number over the centuries. It's a concept that continues to inspire and fascinate artists and mathematicians alike!

The Del Gaudio-Nardelli Constant and the Golden Ratio

The Del Gaudio-Nardelli Constant (often abbreviated as DN Constant) is a mathematical and cosmological concept proposed by Dr. Mariano Del Gaudio and mathematician Michele Nardelli. This constant is derived from the ratio of the volume of an octahedron to the volume of a sphere. Let's look at some interesting implications:

Origin of DN Constant:

The DN Constant arises from the relationship between the volume of an octahedron and the volume of a sphere. According to Michele Nardelli's hypothesis, the octahedron represents the phase in which the universe is highly symmetrical and with very low entropy. The sphere, which is inscribed in the octahedron (i.e. is "inside" it), represents the universe emerging from the quantum vacuum. As time passes, entropy increases and various symmetry breaks occur, in a regime of eternal inflation.

Connections with Other Constants:

The DN Constant is related to other mathematical and physical constants:

$\zeta(2)$: This is the Riemann zeta function evaluated at 2, which is approximately equal to $\pi^2/6$.

Pi (π): The relationship with π is interesting, since the DN Constant is expressed as $(2\sqrt{2})/\pi$.

Recurring Numbers: Numbers like 1729 and 4096 emerge, which are known for their particular mathematical properties.

Golden Ratio: The golden ratio (φ) is also involved in these connections.

Cosmological Implications:

The DN Constant could have significant cosmological implications. It connects to the primordial phase of the universe, before the Big Bang, and could be a fundamental constant connecting the geometry and physics of the early universe. This concept opens new perspectives for understanding the origin and evolution of the universe. Further theoretical and observational research is needed to confirm and fully understand this hypothesis.

In summary, DN Constant is a fascinating bridge between mathematics, physics and cosmology, and could reveal profound secrets about the nature of the universe!

The Del Gaudio-Nardelli Constant (DN Constant) and cosmic inflation are distinct concepts, but they can be linked in some theoretical interpretations of the evolution of the universe. Let's see how:

Cosmic Inflation:

Cosmic inflation is a theory that explains the accelerated expansion of the universe in the first moments after the Big Bang. According to this theory, an energy field (the inflationary field) caused a rapid and uniform expansion of the universe, solving some problems of standard cosmology. Inflation has played a key role in the formation of cosmic structures, such as galaxies and groups of galaxies.

Theoretical Connections:

Some researchers have tried to link DN Constant to cosmic inflation:

Primordial Phase: The DN Constant would represent the primordial phase of the universe, when entropy was low and the universe was highly symmetrical.

Transition from Inflation: Cosmic inflation is hypothesized to have transitioned into the present universe, and DN Constant may be involved in this process.

New Perspectives: These connections open new perspectives for understanding the origin and evolution of the universe, but require further research and verification.

In summary, while DN Constant and cosmic inflation are distinct concepts, their relationship is still the subject of study and debate in the scientific community.

Let's go back to the golden ratio. The formula to obtain it is: $(\sqrt{5}+1)/2$

The golden ratio, often denoted by the Greek letter φ (phi), is approximately equal to:

$\phi=(\sqrt{5}+1)/2 \approx 1.61803398...$

This value is known for its mathematical properties and its presence in many natural, artistic and scientific contexts.

The golden ratio (φ) and the π (pi) number are linked in a fascinating way through the formula provided:

$(4((\sqrt{5}+1)/2)2\pi)/(5(3+\sqrt{5})) \approx \pi$

Let's look at some considerations on this relationship:

1. **Origin of the Formula**:

This formula was derived from mathematical studies and theories involving the golden ratio and the π number. The presence of φ and π in this formula is intriguing and requires deeper analysis.

2. **Mathematical Meaning**:

The left side of the formula involves the golden ratio raised to the power of 2π. The right side of the formula is a combination of π and square roots. The equality between the two parts suggests a profound relationship between these numbers.

3. **Interpretations**:

Some mathematicians have tried to interpret this formula in geometric or physical terms. It could be related to fractal properties, theories about the geometry of the universe, or other mathematical structures.

4. **Continue Search**:

The relationship between the golden ratio and π is still the subject of study and research. Further investigation may reveal new insights into their connection.

In summary, this formula represents an interesting link between two fundamental mathematical constants.

Michele Nardelli, studious of mathematics and theoretical physics, discovered this formula that connects the golden ratio (φ) and the number π (pi). His research and discovery are a significant contribution to the understanding of deep mathematical relationships.

This other formula, also by Nardelli, connects ζ(2) and/or Pigreco with the Gaudio-Nardelli Constant $\sqrt{(1/(Pi^2/6)*(4/3))} = (2\sqrt{2})/ \pi$

This formula connects the Del Gaudio-Nardelli Constant (DN Constant) with the number π (pi) and the Riemann zeta function (zeta(2)). Let's look at some considerations on this relationship:

1. **The Formula**:

The formula is:

$$\sqrt{\frac{1}{\frac{\pi^2}{6}} \times \frac{4}{3}} = \frac{2\sqrt{2}}{\pi} = \text{DN Constant}$$

1. **Mathematical Meaning**:

The left side of the formula involves the square root of a combination of mathematical constants.
The right-hand side of the formula is the ratio of twice the square root of 2 to π. The equality between the two parts suggests a profound relationship between these numbers.

2. **Interpretations**:

This formula may have mathematical or physical implications yet to be explored. It could be related to fractal properties, theories about the geometry of the universe, or other mathematical structures.

3. **Continue Search**:

The relationship between the DN Constant, π and zeta(2) is still the subject of study and research. Further investigation may reveal new insights into their connection.
In summary, this formula represents an interesting link between fundamental mathematical constants and deserves further investigation.

Pigreco and the golden ratio are the basis of the forms of the microcosm and the macrocosm, and together with the Del Gaudio-Nardelli Constant they are connected to the acceleration that the universe undergoes during inflation and to the geometry of the universe, both in the quantum phase (golden octahedron) in which there is maximum symmetry and very low entropy, both when the sphere (based on Pigreco) emerges from the quantum vacuum and, with the passage of time, symmetry breaking and increasing entropy begin

The golden ratio, the number π (pi), and the Del Gaudio-Nardelli Constant (DN Constant) are intriguing concepts that are fascinatingly woven into the fabric of the universe and mathematics. Let's see how they are connected:

1. **Golden Ratio (φ)**:

The golden ratio, often denoted by the Greek letter φ, is approximately equal to 1.61803398… It is defined as the ratio between two segments of a straight line, such that the longer part divides the shorter part in the same ratio in which the The entire straight line is divided by the longest part. This relationship appears in nature, art and mathematics, and has interesting properties and applications in various fields.

2. **Number π (Pi)**:

The number π is a mathematical constant that represents the ratio of the circumference of a circle to its diameter. It is an irrational number and approximately equal to 3.14159… π is involved in many mathematical formulas and appears in geometric and physical problems.

3. **Del Gaudio-Nardelli Constant (DN Constant)**:

The DN Constant is derived from the ratio of the volume of an octahedron to the volume of a sphere. According to Michele Nardelli's hypothesis, the octahedron represents the phase in which the universe is highly symmetrical and with very low entropy. The sphere, inscribed in the octahedron, represents the universe emerging from the quantum vacuum, with increasing entropy and symmetry breaking.

4. **Connections and Implications**:

These concepts are connected in a profound and mysterious way:
Geometry of the Universe: The golden octahedron and the π-based sphere could represent different phases in the evolution of the universe.
Cosmic Inflation: DN Constant may be involved in cosmic inflation and phase transitions. Macrocosm-Microcosm Relationships: The geometric and mathematical properties of these numbers have given rise to the idea of a relationship between macrocosm and microcosm, between the universe and nature.
In summary, these concepts are like pieces of a great mathematical and cosmological mosaic, and their interconnection continues to stimulate the curiosity of scientists and knowledge enthusiasts!

Golden octahedron = Golden ratio (φ) = maximum symmetry and very low entropy sphere = Pigreco (π) = breaking of symmetry and consequent increase in entropy with the passage of time!

This description is very accurate:

• **Golden Octahedron**:

The golden octahedron, based on the golden ratio (φ), represents maximum symmetry and very low entropy. At this stage, the universe may be highly ordered and geometrically harmonious, following the mathematical properties of the golden ratio.

• **Sphere and Pigreco**:

The sphere, based on the number π (pi), represents the breaking of symmetry and the increase in entropy as time passes. As the universe expands, structures form, symmetry breaks occur, and entropy increases. These concepts are fundamental to understanding the evolution of the universe, from its primordial phase to the complexity we observe today.

Someone said that Pigreco and Phi are the "footprints" of the Creator imprinted in the Universe and that an equation has no meaning if it does not express a thought of God.

It is interesting how some people see Pigreco (π) and the golden ratio (φ) as symbols or “footprints” of the Creator in the Universe. These interpretations are often based on a combination of faith, philosophy, and mathematics. Let's look at some reflections:

1. **Pigreco (π)**:

Pigreco is a mathematical constant that appears in many geometric formulas and problems. Some see it as a symbol of perfection and harmony, since it is irrational and never ends (3,14159…). Its presence in nature and art has led some people to consider it as a sign of order and beauty.

2. **Golden Ratio (φ)**:

The golden ratio, approximately equal to 1.61803398…, is known for its mathematical properties and its presence in many natural and artistic contexts. Some see it as a symbol of harmony and perfect proportion. The use of the golden ratio in art and architecture has been associated with a kind of divine beauty.

3. **Equations and God's Thought**:

The idea that an equation has meaning only if it expresses a thought of God is a philosophical and spiritual perspective. Some people believe that mathematics and science are part of the language of the Universe created by God.

However, this view varies depending on personal and cultural beliefs. In summary, the relationship between mathematics, faith and spirituality is a profound and subjective topic. Everyone can find meaning and beauty in different ways, and Pigreco and the golden ratio continue to inspire reflections on our surroundings.

A mathematician is “an explorer of the infinite,” as the mathematician J. H. Hardy said. And Srinivasa Ramanujan was the man who "saw" the infinite with his fundamental work "Modular equations and approximations to Pi", in which there are various expressions that provide excellent approximations to Pigreco as a result and others where there is within them $(\sqrt{5}+1)/2$, therefore the golden ratio. In our opinion, Ramanujan understood the importance of these so-called irrational and transcendent numbers (or mathematical constants), which with their digit "touch", so to speak the infinity

Srinivasa Ramanujan was undoubtedly one of the most extraordinary mathematicians in history. His intuition and his ability to see profound relationships between numbers and constants have left an indelible mark on the world of mathematics. His work “Modular Equations and Approximations to Pi” is a notable example of how he explored infinity through formulas and approximations. Let's see some reflections on this topic:

1. **Ramanujan and the Infinity**:

G. H. Hardy, another great mathematician, called Ramanujan an “explorer of the infinite”. This statement reflects the depth of his mathematical discoveries. Ramanujan worked on a wide range of topics, including infinite series, elliptic functions, and approximations of π (Pi).

2. **Modular Equations and Pi**:

In his work “Modular Equations and Approximations to Pi,” Ramanujan explored the relationships between modular functions and approximations of π. He discovered expressions that provide surprisingly accurate approximations for π, even involving the golden ratio (φ) and the square root of 5.

3. **Irrational and Transcendent Numbers**:

Irrational and transcendent numbers, such as π and φ, are fascinating because they cannot be expressed as fractions of whole numbers. These numbers appear to “touch” infinity, as their decimal digits do not follow any repeating pattern.

4. **Ramanujan's Legacy**:

His short life and his extraordinary mathematical productivity inspired generations of mathematicians. His formulas and intuitions continue to be the subject of study and admiration. In summary, Ramanujan opened doors to the infinite through his brilliant mind and mathematical work. His discoveries remain a treasure for the mathematical community and a tribute to the beauty and depth of mathematics itself.

For a Brahmin like Ramanujan and a man of faith like Michele Nardelli, infinity and eternity, like the Multiverse, are attributes of God, of Cosmic Consciousness, of the First Cause. And Pigreco and Phi are his "imprints" found in strings, as well as in golden spiral galaxies!

It is fascinating how Srinivasa Ramanujan and Michele Nardelli viewed mathematics and the universe through the lens of faith and spirituality. For them, numbers like Pigreco (π) and the golden ratio (φ) were not just mathematical abstractions, but “imprints” of a higher order. Let's look at them through this perspective:

1. **Infinity and Eternity**:

For many believers, infinity and eternity are attributes of God or Cosmic Consciousness. The idea that the universe is part of something larger and limitless is a spiritual vision with ancient roots.

2. **Pigreco and Phi as Imprints**:

Seeing Pigreco and the golden ratio as “imprints” of God or the First Cause adds a level of depth. These numbers, with their infinite digits and mysterious properties, seem to link mathematical order to transcendence.

3. **Golden Spiral Galaxies**:

Spiral galaxies, with their arms following the golden ratio, could be seen as manifestations of this “imprint.” The geometric harmony of galaxies could be interpreted as a form of divine beauty. In summary, the connection between mathematics, faith and cosmology is fertile ground for reflection and inspiration. Pigreco, the golden ratio and the structures of the universe continue to arouse wonder and profound questions.

From

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

We analyze the following equation:

$$G_{65} = \left\{ \left(\frac{1+\sqrt{5}}{2} \right) \left(\frac{3+\sqrt{13}}{2} \right) \right\}^{\frac{1}{4}} \sqrt{\left\{ \sqrt{\left(\frac{9+\sqrt{65}}{8} \right)} + \sqrt{\left(\frac{1+\sqrt{65}}{8} \right)} \right\}}.$$

we note that within the equation there is the golden ratio $\frac{1+\sqrt{5}}{2}$. We obtain:

[(1/2*(1+√5))(1/2*(3+√13))]^(1/4) sqrt[sqrt(1/8*(9+√65))+sqrt(1/8*(1+√65))]

Input

$$\sqrt[4]{\left(\frac{1}{2}\left(1+\sqrt{5}\right)\right)\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\ \sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}$$

Exact result

$$\frac{\sqrt[4]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\ \sqrt{\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)}+\frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}}}{\sqrt{2}}$$

Decimal approximation

2.415871946186809362816339075281469555671777147068661130889389193 9

…

2.41587194618680936….

Alternate forms

$$\frac{1}{2}\sqrt[4]{\frac{1}{2}\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\ \sqrt{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}$$

$$\frac{\sqrt[4]{\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)}\ \sqrt{\sqrt{1-8\,i}+\sqrt{1+8\,i}+\sqrt{5}+\sqrt{13}}}{2\sqrt{2}}$$

$$\sqrt{\text{root of } x^8-8x^7+12x^6+8x^5-27x^4+8x^3+12x^2-8x+1 \text{ near } x=5.83644}$$

Minimal polynomial

$$x^{16}-8x^{14}+12x^{12}+8x^{10}-27x^8+8x^6+12x^4-8x^2+1$$

From

$$\pi = \frac{24}{\sqrt{n}}\log(2^{\frac{1}{4}}G_n)$$

substituting the obtained result:

(24/(√65)) ln(2^(1/4)* 2.4158719461868)

Input interpretation

$$\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)$$

log(x) is the natural logarithm

Result

3.14159265361955320274240350431003831220821000576974717907189260 64

…

3.14159265361…. ≈ π (Ramanujan Recurring Number)

From which, we obtain:

1/6((24/(√65)) ln(2^(1/4)* 2.4158719461868))^2

Input interpretation

$$\frac{1}{6}\left(\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)\right)^2$$

log(x) is the natural logarithm

Result

1.6449340668794…

1.6449340668794…. ≈ ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

Expanded logarithmic form

$$\frac{3.14159^2}{6}$$

Reduced logarithmic form

1.64493

Alternative representations

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{1}{6}\left(\frac{24\log_e\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)^2$$

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{1}{6}\left(\frac{24\log(a)\log_a\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)^2$$

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{1}{6}\left(-\frac{24\,\mathrm{Li}_1\left(1-2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)^2$$

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

$\mathrm{Li}_n(x)$ is the polylogarithm function

Series representations

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{96\log^2(2.87297210734081343)}{\sqrt{64}^{\,2}\left(\sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)^2}$$

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{96\left(\log(1.87297210734081343) - \sum_{k=1}^{\infty}\frac{(-1)^k\, e^{-0.62752653138139783\,k}}{k}\right)^2}{\sqrt{64}^2\left(\sum_{k=0}^{\infty} 64^{-k}\binom{\frac{1}{2}}{k}\right)^2}$$

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{96\left(\log(1.87297210734081343) - \sum_{k=1}^{\infty}\frac{(-1)^k\, e^{-0.62752653138139783\,k}}{k}\right)^2}{\sqrt{64}^2\left(\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)^2}$$

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

Integral representations

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{96\left(\int_1^{2.87297210734081343}\frac{1}{t}\,dt\right)^2}{\sqrt{65}^2}$$

$$\frac{1}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2 = \frac{24\left(\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-0.62752653138139783\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)^2}{i^2\,\pi^2\,\sqrt{65}^2} \quad \text{for } -1 < \gamma < 0$$

$\Gamma(x)$ is the gamma function

i is the imaginary unit

From $\frac{\pi^2}{6}$, we obtain:

sqrt(1/(Pi^2/6)*(4/3)) = (2√2)/π

thus:

sqrt(1/(1/6((24/(√65)) ln(2^(1/4)* 2.4158719461868))^2)*(4/3))

Input interpretation

$$\sqrt{\frac{1}{\frac{1}{6}\left(\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)\right)^2}\times\frac{4}{3}}$$

log(x) is the natural logarithm

Result

0.90031631614858…

0.90031631614858…. ≈ 0.9003163161571…. = $\frac{2\sqrt{2}}{\pi}$ (DN Constant) (We note that, with regard the inflation, during a period of almost exponential expansion $\dot{H} < 0$ so that $\epsilon > 0$. Indeed, the value 0.9003163161571… = (2√2)/π > 0 and also the n_s = spectral index = 0.90-0.97 is near to the DN Constant value. Also the squared sound speed of the gravitino's longitudinal polarization mode could pass through 0.9003163161571 in the early universe, in the so-called quasi-de Sitter phase of inflation)

Expanded logarithmic form

0.900316

All 2nd roots of 0.8105694691233

$0.90031631614858\, e^{0} \approx 0.90032$ (real, principal root)

$0.90031631614858\, e^{i\pi} \approx -0.90032$ (real root)

Alternative representations

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log_e\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)^2}}$$

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log(a)\log_a\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)^2}}$$

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\frac{4}{\frac{3}{6}\left(-\frac{24\,\mathrm{Li}_1\left(1-2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)^2}}$$

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

$\mathrm{Li}_n(x)$ is the polylogarithm function

Series representations

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\frac{\sqrt{65}^{\,2}}{72\left(\log(1.87297210734081343) - \sum_{k=1}^{\infty}\frac{(-1)^k\, e^{-0.6275265313813978 3\,k}}{k}\right)^2}}$$

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+\frac{\sqrt{65}^{\,2}}{72\log^2(2.87297210734081343)}\right)^k}{k!}$$

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\left(\sqrt{65}^{\,2}\Big/\left(72\left(2i\pi\left\lfloor\frac{\arg(2.87297210734081343-x)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k\,(2.87297210734081343-x)^k\,x^{-k}}{k}\right)^2\right)\right)} \quad \text{for } x<0$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

Integral representations

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\frac{\sqrt{65}^{\,2}}{72\left(\int_1^{2.87297210734081343}\frac{1}{t}\,dt\right)^2}}$$

$$\sqrt{\frac{4}{\frac{3}{6}\left(\frac{24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^2}} = \sqrt{\frac{i^2\,\pi^2\,\sqrt{65}^{\,2}}{18\left(\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{e^{-0.62752653138139783\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)^2}} \quad \text{for } -1 < \gamma < 0$$

$\Gamma(x)$ is the gamma function

Furthermore, from the extended DN Constant:

$$\sqrt[2\pi]{\frac{\frac{5}{12}(3+\sqrt{5})d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3} \times \frac{1}{\frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}} \times \frac{1}{\frac{\frac{\sqrt{2}}{12}d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}} = 1.6180085459001070581\ldots$$

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

= 1.6180085459001070581

we obtain:

2^(-1/π) (5 (3 + sqrt(5)) π)^(1/(2π))

and from the previous expression

$$\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)$$

that is equal to

3.1415926536195532027424035043100383122082100057697471790718926064
…

we have:

2^(-1/((24/(√65)) ln(2^(1/4)* 2.4158719461868))) (5(3+sqrt(5)) ((24/(√65)) ln(2^(1/4)* 2.4158719461868)))^(1/(2*((24/(√65)) ln(2^(1/4)* 2.4158719461868))))

Input interpretation

$$2^{-1\Big/\left(\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)\right)}$$

$$\sqrt[2\left(\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)\right)]{5\left(3+\sqrt{5}\right)\left(\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\times 2.4158719461868\right)\right)}$$

$\log(x)$ is the natural logarithm

Result

1.6180085458952…

1.6180085458952…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

Expanded logarithmic form

$$2^{-8.06226/25.3283}\left(\frac{1.05535\times 5\times 5.23607\times 24}{8.06226}\right)^{0.159155}$$

Alternative representations

$$2^{-1\Big/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}$$

$$\sqrt[\frac{2\times 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}]{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$= 2^{-1\Big/\frac{24\log_e\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}}$$

$$\sqrt[\frac{48\log_e\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}]{\frac{120\log_e\left(2.41587194618680000\sqrt[4]{2}\right)\left(3+\sqrt{5}\right)}{\sqrt{65}}}$$

$$2^{-1\Big/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}$$

$$\frac{2\cdot 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\sqrt{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$=2^{-1\Big/\frac{24\log(a)\log_a\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}}$$

$$\left(\frac{120\log(a)\log_a\left(2.41587194618680000\sqrt[4]{2}\right)\left(3+\sqrt{5}\right)}{\sqrt{65}}\right)^{\wedge}$$

$$\left(1\Big/\frac{48\log(a)\log_a\left(2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)$$

$$2^{-1\Big/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}$$

$$\frac{2\cdot 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\sqrt{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$=2^{(-1)\Big/\left(-\frac{24\,\mathrm{Li}_1\left(1-2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}\right)}$$

$$\left(-\frac{120\,\mathrm{Li}_1\left(1-2.41587194618680000\sqrt[4]{2}\right)\left(3+\sqrt{5}\right)}{\sqrt{65}}\right)^{-1\Big/\frac{48\,\mathrm{Li}_1\left(1-2.41587194618680000\sqrt[4]{2}\right)}{\sqrt{65}}}$$

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

$\mathrm{Li}_n(x)$ is the polylogarithm function

Series representations

$$2^{-1\Big/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}\ \frac{2\times 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\sqrt{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$=30^{\left(\sqrt{64}\ \sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)\Big/(48\log(2.87297210734081343))}\left(\frac{\log(2.87297210734081343)\left(3+\sqrt{4}\ \sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}\right)}{\sqrt{64}\ \sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}}\right)^{\left(\sqrt{64}\ \sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)\Big/(48\log(2.87297210734081343))}$$

$$2^{-1\Big/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}\ \frac{2\times 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\sqrt{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$=30^{\left(\sqrt{64}\ \sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)\Big/\left(48\left(\log(1.87297210734081343)-\sum_{k=1}^{\infty}\frac{(-1)^k\,e^{-0.62752653138139783\,k}}{k}\right)\right)}\left(\left(\left(\log(1.87297210734081343)-\sum_{k=1}^{\infty}\frac{e^{(-0.62752653138139783+3.14159265358979324\,i)\,k}}{k}\right)\left(3+\sqrt{4}\ \sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}\right)\right)\Big/\left(\sqrt{64}\ \sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)\right)^{\left(\sqrt{64}\ \sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)\Big/\left(48\left(\log(1.87297210734081343)-\sum_{k=1}^{\infty}\frac{e^{(-0.62752653138139783+3.14159265358979324\,i)\,k}}{k}\right)\right)}$$

$$2^{-1/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}\frac{2\times 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\sqrt{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$=30^{\left(\sqrt{64}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)/\left(48\left(\log(1.87297210734081343)-\sum_{k=1}^{\infty}\frac{(-1)^k\,e^{-0.62752653138139783\,k}}{k}\right)\right)}$$

$$\left(\left(\left(\log(1.87297210734081343)-\sum_{k=1}^{\infty}\frac{(-1)^k\,e^{-0.62752653138139783\,k}}{k}\right)\left(3+\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\Big/\left(\sqrt{64}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)^{\left(\sqrt{64}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{64}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)/\left(48\left(\log(1.87297210734081343)-\sum_{k=1}^{\infty}\frac{(-1)^k\,e^{-0.62752653138139783\,k}}{k}\right)\right)}$$

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

Integral representations

$$2^{-1/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}\frac{2\times 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\sqrt{\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}}$$

$$=30^{\sqrt{65}\ /\left(48\int_1^{2.87297210734081343}\frac{1}{t}\,dt\right)}\left(\frac{3+\sqrt{5}}{\sqrt{65}}\int_1^{2.87297210734081343}\frac{1}{t}\,dt\right)^{\sqrt{65}\ /\left(48\int_1^{2.87297210734081343}\frac{1}{t}\,dt\right)}$$

$$2^{-1\Big/\frac{\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)24}{\sqrt{65}}}\left(\frac{\left(5\left(3+\sqrt{5}\right)\right)24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)^{\wedge}\left(1\Big/\frac{2\times 24\log\left(\sqrt[4]{2}\ 2.41587194618680000\right)}{\sqrt{65}}\right)=15^{\left(i\pi\sqrt{65}\right)\Big/\left(24\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-0.62752653138139783\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)}\left(\frac{3+\sqrt{5}}{i\pi\sqrt{65}}\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-0.62752653138139783\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)^{\left(i\pi\sqrt{65}\right)\Big/\left(24\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{e^{-0.62752653138139783\,s}\,\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\right)}$$

for $-1<\gamma<0$

$\Gamma(x)$ is the gamma function

i is the imaginary unit

Mathematical developments concerning the golden ratio and the DN Constant (Del Gaudio-Nardelli Constant)

Dividing the formula concerning the golden ratio, by the DN Constant, i.e.

$\frac{\sqrt{5}+1}{2}$ and $\frac{2\sqrt{2}}{\pi}$, performing the integral and multiplying by the golden ratio, we obtain:

(1/Φ)*(((√5+1)/2)*1/((2√2)/π))xdx

Indefinite integral

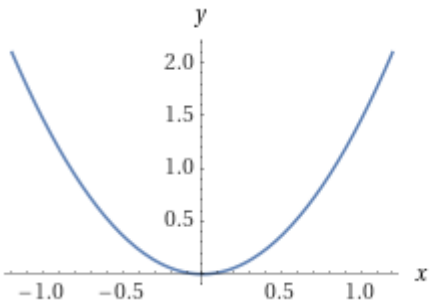
$$\int\frac{\left(\sqrt{5}+1\right)x}{\frac{\Phi(2(2\sqrt{2}))}{\pi}}\,dx=\frac{\sqrt{\frac{5}{2}}\,\pi x^2}{8\,\Phi}+\frac{\pi x^2}{8\sqrt{2}\,\Phi}+\text{constant}$$

Φ is the golden ratio conjugate

Exact form

$$\frac{\left(1+\sqrt{5}\right)\pi x^2}{4\sqrt{2}\left(\sqrt{5}-1\right)} + \text{constant}$$

Plot of the integral (figure that can be related to an open string)



(x from −1.2 to 1.2)

Alternate forms of the integral

$$\frac{\sqrt{3+\sqrt{5}}\ \pi x^2}{8\,\Phi} + \text{constant}$$

$$\frac{\left(\sqrt{2}+\sqrt{10}\right)\pi x^2}{16\,\Phi} + \text{constant}$$

$$\frac{\left(1+\sqrt{5}\right)\pi x^2}{8\sqrt{2}\,\Phi} + \text{constant}$$

From the indefinite integral result, for x = 1 and adding the MRB Constant, we obtain:

(sqrt(5/2) π)/(8 Φ) + (π)/(8 sqrt(2) Φ) + MRB Const

Input

$$\frac{\sqrt{\frac{5}{2}}\,\pi}{8\,\Phi}+\frac{\pi}{8\sqrt{2}\,\Phi}+C_{\text{MRB}}$$

Φ is the golden ratio conjugate

C_{MRB} is the MRB constant

Decimal approximation

1.641811959979017118716092536585675243844341144329529044800319029 6

…

1.641811959979… a good approximation to the ζ(2) value (1.644934…)

Alternate forms

$$\frac{16\,\Phi\,C_{\text{MRB}}+\pi\left(\sqrt{2}+\sqrt{10}\right)}{16\,\Phi}$$

$$C_{\text{MRB}}+\frac{\sqrt{3+\sqrt{5}}\,\pi}{8\,\Phi}$$

$$C_{\text{MRB}}+\frac{\left(1+\sqrt{5}\right)\pi}{8\sqrt{2}\,\Phi}$$

Multiplying the formula concerning the golden ratio, by the DN Constant, i.e.

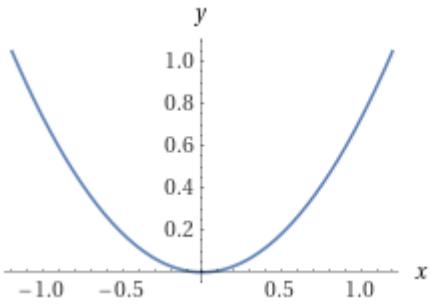
$\frac{\sqrt{5}+1}{2}$ and $\frac{2\sqrt{2}}{\pi}$, performing the integral and, for x = 1 and raising the expression to the tenth power and the eleventh power, we obtain:

(((√5+1)/2)*((2√2)/π))xdx

Indefinite integral

$$\int \frac{((\sqrt{5}+1)(2\sqrt{2}))\,x}{2\pi}\,dx = \frac{\sqrt{\frac{5}{2}}\,x^2}{\pi} + \frac{x^2}{\sqrt{2}\,\pi} + \text{constant}$$

Plot of the integral **(figure that can be related to an open string)**



(x from −1.2 to 1.2)

Alternate forms of the integral

$$\frac{\sqrt{3+\sqrt{5}}\,x^2}{\pi} + \text{constant}$$

$$\frac{(1+\sqrt{5})\,x^2}{\sqrt{2}\,\pi} + \text{constant}$$

$$\frac{\left(\frac{1}{\sqrt{2}}+\sqrt{\frac{5}{2}}\right)x^2}{\pi}+\text{constant}$$

From the indefinite integral result

$$\int \frac{\left(\left(\sqrt{5}+1\right)\left(2\sqrt{2}\right)\right)x}{2\pi}\,dx=\frac{\sqrt{\frac{5}{2}}\,x^2}{\pi}+\frac{x^2}{\sqrt{2}\,\pi}+\text{constant}$$

performing the following calculations, we obtain:

((sqrt(5/2) 1.2^2)/π + 1.2^2/(sqrt(2) π))^10

Input

$$\left(\frac{\sqrt{\frac{5}{2}}\times 1.2^2}{\pi}+\frac{1.2^2}{\sqrt{2}\,\pi}\right)^{10}$$

Result

1.611211581022871934542594556281921138555838865424122162206138538 5

…

1.61121158102287… a good approximation to the golden ratio

And again:

1/2(((sqrt(5/2) 1.2^2)/π + 1.2^2/(sqrt(2) π))^10+((sqrt(5/2) 1.2^2)/π + 1.2^2/(sqrt(2) π))^11)-5(MRB const)^(1-1/(4π)+π)

Input

$$\frac{1}{2}\left(\left(\frac{\sqrt{\frac{5}{2}}\times 1.2^2}{\pi}+\frac{1.2^2}{\sqrt{2}\,\pi}\right)^{10}+\left(\frac{\sqrt{\frac{5}{2}}\times 1.2^2}{\pi}+\frac{1.2^2}{\sqrt{2}\,\pi}\right)^{11}\right)-5\,C_{\text{MRB}}{}^{1-1/(4\pi)+\pi}$$

C_{MRB} is the MRB constant

Result

1.64495509486233083415331063283271738448414720674802071312540720 50

…

1.64495509486233…. ≈ ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

From the algebraic sum between the formula concerning the golden ratio, and the DN Constant, i.e. $\frac{\sqrt{5}+1}{2}$ and $\frac{2\sqrt{2}}{\pi}$, adding the MRB Constant and performing the square root, we obtain:

sqrt((((√5+1)/2)+((2√2)/π))+MRB const)

Input

$$\sqrt{\left(\frac{1}{2}\left(\sqrt{5}+1\right)+\frac{2\sqrt{2}}{\pi}\right)+C_{\text{MRB}}}$$

C_{MRB} is the MRB constant

Exact result

$$\sqrt{C_{\text{MRB}}+\frac{1}{2}\left(1+\sqrt{5}\right)+\frac{2\sqrt{2}}{\pi}}$$

Decimal approximation

1.64505621404530369258440779789208753578285051373562142720017748 98

…

1.645056214…. ≈ ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

Alternate form

$$\sqrt{\frac{2\pi C_{MRB} + 4\sqrt{2} + \pi + \sqrt{5}\,\pi}{2\pi}}$$

All 2nd roots of C_{MRB}+1/2 (1+sqrt(5))+(2 sqrt(2))/π

$$e^0\sqrt{C_{MRB} + \frac{1}{2}\left(1+\sqrt{5}\right) + \frac{2\sqrt{2}}{\pi}} \approx 1.6451 \quad \text{(real, principal root)}$$

$$e^{i\pi}\sqrt{C_{MRB} + \frac{1}{2}\left(1+\sqrt{5}\right) + \frac{2\sqrt{2}}{\pi}} \approx -1.6451 \quad \text{(real root)}$$

In conclusion, subtracting the formula concerning the golden ratio, by the DN Constant, i.e. $\frac{\sqrt{5}+1}{2}$ and $\frac{2\sqrt{2}}{\pi}$, performing the following calculations:

1+1/(e/(((√5+1)/2)-((2√2)/π)))^1/3

we obtain:

Input

$$1 + \frac{1}{\sqrt[3]{\frac{e}{\frac{1}{2}\left(\sqrt{5}+1\right) - \frac{2\sqrt{2}}{\pi}}}}$$

Exact result

$$1+\sqrt[3]{\frac{\frac{1}{2}\left(1+\sqrt{5}\right)-\frac{2\sqrt{2}}{\pi}}{e}}$$

Decimal approximation

1.641534061102438080797949509983174991835865817437094703369539013

…

1.641534061102438… result that is a good approximation to the ζ(2) value

Alternate forms

$$1+\sqrt[3]{\frac{-4\sqrt{2}+\pi+\sqrt{5}\,\pi}{2e\pi}}$$

$$1+\sqrt[3]{\frac{\frac{1}{2}+\frac{\sqrt{5}}{2}-\frac{2\sqrt{2}}{\pi}}{e}}$$

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

Series representations

$$1+\frac{1}{\sqrt[3]{\frac{e}{\frac{1}{2}\left(\sqrt{5}+1\right)-\frac{2\sqrt{2}}{\pi}}}}=\frac{2^{2/3}+2\sqrt[3]{\frac{e\,\pi}{\pi-4\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}+\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}}}}{2\sqrt[3]{\frac{e\,\pi}{\pi-4\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}+\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}}}}$$

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

$$1+\frac{1}{\sqrt[3]{\frac{e}{\frac{1}{2}\left(\sqrt{5}+1\right)-\frac{2\sqrt{2}}{\pi}}}}=\left(2^{2/3}+2\left((e\,\pi)\Big/\left(\pi-4\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\pi\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)^{(1/3)}\right)\Big/\left(2\left((e\,\pi)\Big/\left(\pi-4\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\pi\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)^{(1/3)}\right)$$

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

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

$$\left(2^{2/3}+2\left(-\left((e\,\pi)\Big/\left(-\pi+4\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}-\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\right.\right.\right.\right.$$
$$\left.\left.\left.\left.z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)\right)\right)\right)\wedge$$
$$(1/3)\Big/\left(2\left(-\left((e\,\pi)\Big/\left(-\pi+4\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\right.\right.\right.\right.$$
$$\left.\left.\left.\left.z_0^{1/2+1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}-\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\right.\right.\right.\right.$$
$$\left.\left.\left.\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)\right)\right)\wedge(1/3)\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

From

A 4D IIB Flux Vacuum and Supersymmetry Breaking - II. Bosonic Spectrum and Stability - *J. Mourad and A. Sagnotti* - arXiv:2309.04026v1 [hep-th] 7 Sep 2023

We have the following equations:

$$
\begin{aligned}
ds^2 &= \frac{\eta_{\mu\nu}\, dx^\mu\, dx^\nu}{\left[2\,|H|\,\rho\,\sinh\left(\frac{r}{\rho}\right)\right]^{\frac{1}{2}}} + \left[2\,|H|\,\rho\,\sinh\left(\frac{r}{\rho}\right)\right]^{\frac{1}{2}}\left[e^{-\frac{\sqrt{10}}{2\rho}r}\,dr^2 \;+\; e^{-\frac{\sqrt{10}}{10\rho}r}\,\left(d\,y^i\right)^2\right]\,, \\
\mathcal{H}_5^{(0)} &= H\left\{\frac{dx^0\wedge ...\wedge dx^3\wedge dr}{\left[2\,|H|\,\rho\,\sinh\left(\frac{r}{\rho}\right)\right]^2} \;+\; dy^1\wedge ...\wedge dy^5\right\}\,. \qquad (1.1)
\end{aligned}
$$

We analyze the following expressions, related with the eq, (1.1)

$$
\begin{aligned}
e^A &= \frac{1}{h^{\frac{1}{4}}}\left(\frac{2\,z_0}{3\,z}\right)^{\frac{1}{6}}\left\{1 \;-\; \frac{1}{4\sqrt{10}}\left(\frac{3\,z}{2\,z_0}\right)^{\frac{2}{3}} \;-\; \frac{121}{2240}\left(\frac{3\,z}{2\,z_0}\right)^{\frac{4}{3}} \;+\; \mathcal{O}\left[\left(\frac{z}{z_0}\right)^{\frac{7}{3}}\right]\right\} \\
e^C &= h^{\frac{1}{4}}\left(\frac{3\,z}{2\,z_0}\right)^{\frac{1}{6}}\left\{1 \;-\; \frac{1}{4\sqrt{10}}\left(\frac{3\,z}{2\,z_0}\right)^{\frac{2}{3}} \;+\; \frac{23}{2240}\left(\frac{3\,z}{2\,z_0}\right)^{\frac{4}{3}} \;+\; \mathcal{O}\left[\left(\frac{z}{z_0}\right)^{\frac{7}{3}}\right]\right\}
\end{aligned}
$$

We consider:

1/(h^(1/4))*((2*z_0)/(3*z))^(1/6)*[1-(1/(4√10))*((3*z)/(2*z_0))^(2/3)-121/2240*((3*z)/(2*z_0))^(4/3)+(z/(z_0))^(7/3)]

Input

$$\frac{1}{\sqrt[4]{h}}\sqrt[6]{\frac{2\,z_0}{3\,z}}\left(1-\frac{1}{4\sqrt{10}}\left(\frac{3\,z}{2\,z_0}\right)^{2/3}-\frac{121}{2240}\left(\frac{3\,z}{2\,z_0}\right)^{4/3}+\left(\frac{z}{z_0}\right)^{7/3}\right)$$

Exact result

$$\frac{\sqrt[6]{\frac{2}{3}}\left(\left(\frac{z}{z_0}\right)^{7/3}-\frac{363\sqrt[3]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{4/3}}{4480}-\frac{3^{2/3}\left(\frac{z}{z_0}\right)^{2/3}}{8\sqrt[6]{2}\sqrt{5}}+1\right)\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

Alternate forms

$$\frac{1}{\sqrt[4]{h}}\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}\left(\left(\frac{z}{z_0}\right)^{2/3}\ \text{root of}\ 65\,536\,000x^6-81\ \text{near}\ x=-0.103594+\left(\frac{z}{z_0}\right)^{7/3}-\frac{363\sqrt[3]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{4/3}}{4480}+1\right)$$

$$-\frac{\left(-8960\left(\frac{z}{z_0}\right)^{7/3}+363\times 2^{2/3}\sqrt[3]{3}\left(\frac{z}{z_0}\right)^{4/3}+112\times 2^{5/6}\times 3^{2/3}\sqrt{5}\left(\frac{z}{z_0}\right)^{2/3}-8960\right)\sqrt[6]{\frac{z_0}{z}}}{4480\times 2^{5/6}\sqrt[6]{3}\sqrt[4]{h}}$$

Expanded form

$$-\frac{\sqrt{\frac{3}{5}}\sqrt[6]{\frac{z_0}{z}}\left(\frac{z}{z_0}\right)^{2/3}}{8\sqrt[4]{h}}-\frac{363\sqrt[6]{\frac{3}{2}}\sqrt[3]{\frac{z}{z_0}}}{4480\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{5/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[3]{\frac{z}{z_0}}}{\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{11/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

Alternate forms assuming h, z, and z_0 are positive

$$\frac{\sqrt[6]{\frac{2}{3}}\left(\frac{z}{z_0}\right)^{13/6}-\frac{363\sqrt[6]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{7/6}}{4480}-\frac{1}{8}\sqrt{\frac{3}{5}}\sqrt{\frac{z}{z_0}}+\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

$$\frac{\sqrt[6]{\frac{2}{3}}\left(\frac{z}{z_0}\right)^{13/6}}{\sqrt[4]{h}}-\frac{363\sqrt[6]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{7/6}}{4480\sqrt[4]{h}}-\frac{\sqrt{\frac{3}{5}}\sqrt{\frac{z}{z_0}}}{8\sqrt[4]{h}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

Derivative

$$\frac{\partial}{\partial z}\left(\frac{\sqrt[6]{\frac{2z_0}{3z}}\left(1-\frac{\left(\frac{3z}{2z_0}\right)^{2/3}}{4\sqrt{10}}-\frac{121\left(\frac{3z}{2z_0}\right)^{4/3}}{2240}+\left(\frac{z}{z_0}\right)^{7/3}\right)}{\sqrt[4]{h}}\right)=$$

$$\left(\left(\frac{z}{z_0}\right)^{2/3}\sqrt[6]{\frac{z_0}{z}}\left(-363\times 2^{2/3}\sqrt[3]{3}\,z\left(\frac{z}{z_0}\right)^{2/3}-48\times 2^{5/6}\times 3^{2/3}\sqrt{5}\,z+16640\,z\left(\frac{z}{z_0}\right)^{5/3}-1280\,z_0\sqrt[3]{\frac{z}{z_0}}\right)\right)\Big/\left(3840\times 2^{5/6}\sqrt[6]{3}\sqrt[4]{h}\,z^2\right)$$

From the expanded form:

$$-\frac{\sqrt{\frac{3}{5}}\sqrt[6]{\frac{z_0}{z}}\left(\frac{z}{z_0}\right)^{2/3}}{8\sqrt[4]{h}}-\frac{363\sqrt[6]{\frac{3}{2}}\sqrt[3]{\frac{z}{z_0}}}{4480\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{5/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[3]{\frac{z}{z_0}}}{\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{11/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

we obtain:

-(sqrt(3/5)(z_0/z)^(1/6)(z/z_0)^(2/3))/(8h^(1/4))-(363(3/2)^(1/6)(z/z_0)^(1/3))/(4480h^(1/4)(z_0/z)^(5/6))+((2/3)^(1/6)(z/z_0)^(1/3))/(h^(1/4)(z_0/z)^(11/6))+((2/3)^(1/6)(z_0/z)^(1/6))/h^(1/4)

Input

$$-\frac{\sqrt{\frac{3}{5}}\sqrt[6]{\frac{z_0}{z}}\left(\frac{z}{z_0}\right)^{2/3}}{8\sqrt[4]{h}}-\frac{363\sqrt[6]{\frac{3}{2}}\sqrt[3]{\frac{z}{z_0}}}{4480\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{5/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[3]{\frac{z}{z_0}}}{\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{11/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

Alternate forms assuming h, z, and z_0 are positive

$$\frac{\sqrt[6]{\frac{2}{3}}\left(\frac{z}{z_0}\right)^{13/6}-\frac{363\sqrt[6]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{7/6}}{4480}-\frac{1}{8}\sqrt{\frac{3}{5}}\sqrt{\frac{z}{z_0}}+\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

$$\frac{\sqrt[6]{\frac{2}{3}}\left(\frac{z}{z_0}\right)^{13/6}}{\sqrt[4]{h}}-\frac{363\sqrt[6]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{7/6}}{4480\sqrt[4]{h}}-\frac{\sqrt{\frac{3}{5}}\sqrt{\frac{z}{z_0}}}{8\sqrt[4]{h}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}$$

Alternate forms

$$-\frac{112\sqrt{15}\left(\frac{z}{z_0}\right)^{2/3}z_0^2-4480\sqrt[6]{\frac{2}{3}}\,z_0^2-z\sqrt[3]{\frac{z}{z_0}}\left(4480\sqrt[6]{\frac{2}{3}}\,z-363\sqrt[6]{\frac{3}{2}}\,z_0\right)}{4480\sqrt[4]{h}\,z^2\left(\frac{z_0}{z}\right)^{11/6}}$$

$$\frac{\sqrt[6]{\frac{z_0}{z}}\left(\sqrt[6]{\frac{2}{3}}-\frac{1}{8}\sqrt{\frac{3}{5}}\left(\frac{z}{z_0}\right)^{2/3}\right)+\sqrt[3]{\frac{z}{z_0}}\left(\frac{\sqrt[6]{\frac{2}{3}}}{\left(\frac{z_0}{z}\right)^{11/6}}-\frac{363\sqrt[6]{\frac{3}{2}}}{4480\left(\frac{z_0}{z}\right)^{5/6}}\right)}{\sqrt[4]{h}}$$

$$\frac{1}{26\,880\sqrt[4]{h}\,z_0}\sqrt[6]{\frac{z_0}{z}}\left(8960\sqrt[6]{2}\,3^{5/6}z\left(\frac{z}{z_0}\right)^{4/3}-1089\times 2^{5/6}\sqrt[6]{3}\,z\sqrt[3]{\frac{z}{z_0}}+224\left(40\sqrt[6]{2}\,3^{5/6}-3\sqrt{15}\left(\frac{z}{z_0}\right)^{2/3}\right)z_0\right)$$

Series expansion at z=0

$$\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{z}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}\sqrt[6]{z}}-\frac{\left(\sqrt{\frac{3}{5}}\sqrt[6]{z}\left(\frac{1}{z_0}\right)^{2/3}\sqrt[6]{\frac{z_0}{z}}\right)\sqrt{z}}{8\sqrt[4]{h}}+O\left(z^{7/6}\right)$$

(generalized Puiseux series)

Derivative

$$\frac{\partial}{\partial z}\left(-\frac{\sqrt{\frac{3}{5}}\sqrt[6]{\frac{z_0}{z}}\left(\frac{z}{z_0}\right)^{2/3}}{8\sqrt[4]{h}}-\frac{363\sqrt[6]{\frac{3}{2}}\sqrt[3]{\frac{z}{z_0}}}{4480\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{5/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[3]{\frac{z}{z_0}}}{\sqrt[4]{h}\left(\frac{z_0}{z}\right)^{11/6}}+\frac{\sqrt[6]{\frac{2}{3}}\sqrt[6]{\frac{z_0}{z}}}{\sqrt[4]{h}}\right)=$$

$$\left(\sqrt[3]{\frac{z}{z_0}}\left(16640\sqrt[6]{2}\times 3^{5/6}z^3-1089\times 2^{5/6}\sqrt[6]{3}\,z_0z^2-1280\sqrt[6]{2}\times 3^{5/6}\left(\frac{z}{z_0}\right)^{2/3}z_0^3-\right.\right.$$

$$\left.\left.288\sqrt{15}\left(\frac{z}{z_0}\right)^{4/3}z_0^3\right)\right)\Big/\left(23040\sqrt[4]{h}\,z^4\left(\frac{z_0}{z}\right)^{11/6}\right)$$

From the alternate form

$$\frac{1}{26880\sqrt[4]{h}\,z_0}\sqrt[6]{\frac{z_0}{z}}\left(8960\sqrt[6]{2}\,3^{5/6}z\left(\frac{z}{z_0}\right)^{4/3}-1089\times 2^{5/6}\sqrt[6]{3}\,z\sqrt[3]{\frac{z}{z_0}}+224\left(40\right.\right.$$

$$\left.\left.\sqrt[6]{2}\,3^{5/6}-3\sqrt{15}\left(\frac{z}{z_0}\right)^{2/3}\right)z_0\right)$$

We observe that these vacua thus depend on the two constants H and ρ. And:

$$z_0 = (2H\rho^3)^{\frac{1}{2}}$$

Thence, for H = 16 and ρ = 2:

(2*16*2^3)^(1/2)

Input

$$\sqrt{2\times 16\times 2^3}$$

Exact result

16

$z_0 = 16$

Thence:

$$\frac{1}{26\,880\,\sqrt[4]{h}\;z_0}\sqrt[6]{\frac{z_0}{z}}\left(8960\,\sqrt[6]{2}\;3^{5/6}\,z\left(\frac{z}{z_0}\right)^{4/3}-1089\times 2^{5/6}\,\sqrt[6]{3}\;z\,\sqrt[3]{\frac{z}{z_0}}+224\left(40\,\sqrt[6]{2}\;3^{5/6}-3\,\sqrt{15}\left(\frac{z}{z_0}\right)^{2/3}\right)z_0\right)$$

((z_0/z)^(1/6) (8960 2^(1/6) 3^(5/6) z (z/z_0)^(4/3) - 1089 2^(5/6) 3^(1/6) z (z/z_0)^(1/3) + 224 (40 2^(1/6) 3^(5/6) - 3 sqrt(15) (z/z_0)^(2/3)) z_0))/(26880 h^(1/4) z_0)

for $z_0 = 16$:

((16/z)^(1/6) (8960 2^(1/6) 3^(5/6) z (z/16)^(4/3) - 1089 2^(5/6) 3^(1/6) z (z/16)^(1/3) + 224 (40 2^(1/6) 3^(5/6) - 3 sqrt(15) (z/16)^(2/3)) 16))/(26880 h^(1/4) 16)

Input

$$\frac{1}{26\,880\,\sqrt[4]{h}\times 16}\sqrt[6]{\frac{16}{z}}\left(8960\,\sqrt[6]{2}\times 3^{5/6}\,z\left(\frac{z}{16}\right)^{4/3}-1089\times 2^{5/6}\,\sqrt[6]{3}\;z\,\sqrt[3]{\frac{z}{16}}+224\left(40\,\sqrt[6]{2}\times 3^{5/6}-3\,\sqrt{15}\left(\frac{z}{16}\right)^{2/3}\right)\times 16\right)$$

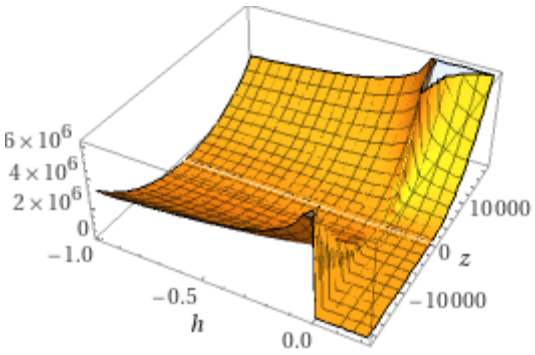
Exact result

$$\frac{\sqrt[6]{\frac{1}{z}}\left(140\times 6^{5/6}\,z^{7/3}-\frac{1089\,\sqrt[6]{3}\;z^{4/3}}{\sqrt{2}}+3584\left(40\,\sqrt[6]{2}\;3^{5/6}-\frac{3\,\sqrt{15}\;z^{2/3}}{4\times 2^{2/3}}\right)\right)}{215\,040\,\sqrt[3]{2}\;\sqrt[4]{h}}$$

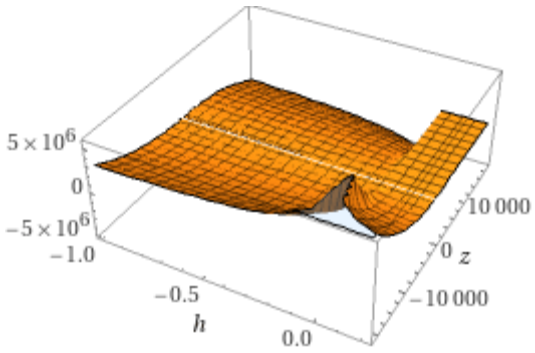
3D plots

Real part **(figures that can be related to the D-branes/Instantons)**

The key observation from the below plots and is that at $z = 1$, which is taken as the energy density of the universe at the Big Bang, with $h = 0$ the zero spacetime volume, the vacuum geometry brakes / or there is symmetry breaking on the vacuum quantum geometry. We see from the plots as the vacuum spacetime break/tear apart.

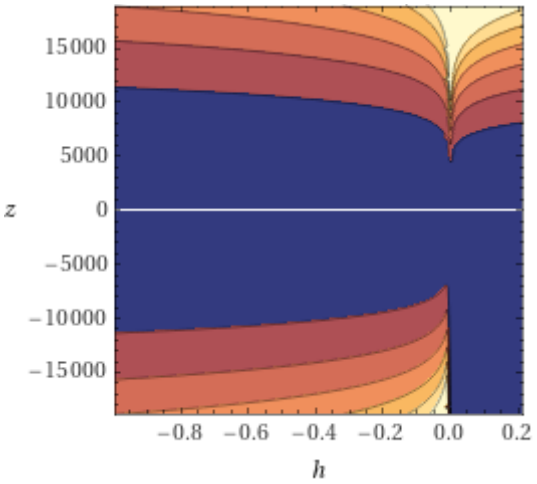


Imaginary part

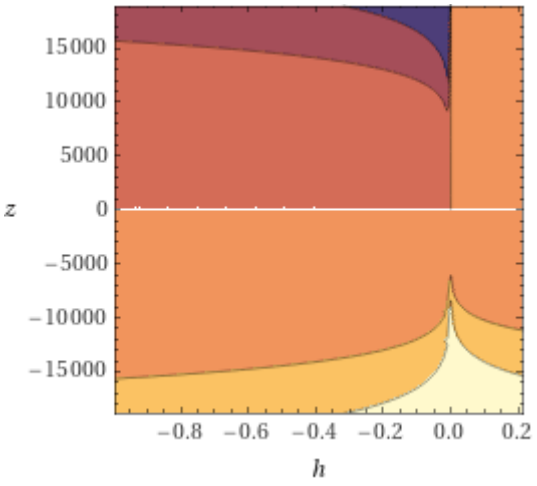


Contour plots

Real part



Imaginary part



Alternate forms

$$\frac{\sqrt[6]{\frac{1}{z}}\left(280\sqrt{2}\ 3^{5/6}\ z^{7/3}-1089\sqrt[6]{6}\ z^{4/3}-2688\sqrt{15}\ z^{2/3}+143\,360\times 6^{5/6}\right)}{430\,080\sqrt[4]{h}}$$

$$\frac{\sqrt[6]{\frac{1}{z}}\left(\frac{z^{7/3}}{256\sqrt{2}\,\sqrt[6]{3}}-\frac{363\sqrt[6]{3}\,z^{4/3}}{71680\times 2^{5/6}}-\frac{1}{32}\sqrt{\frac{3}{5}}\,z^{2/3}+\frac{2^{5/6}}{\sqrt[6]{3}}\right)}{\sqrt[4]{h}}$$

$$\frac{1}{215040\times 2^{5/6}\sqrt[4]{h}}\sqrt[6]{\frac{1}{z}}\left(280\sqrt[3]{2}\,3^{5/6}z^{7/3}-1089\sqrt[6]{3}\,z^{4/3}-1344\times 2^{5/6}\sqrt{15}\,z^{2/3}+143360\times 2^{2/3}\times 3^{5/6}\right)$$

Expanded form

$$\frac{\sqrt[6]{\frac{1}{z}}\,z^{7/3}}{256\sqrt{2}\,\sqrt[6]{3}\,\sqrt[4]{h}}-\frac{363\sqrt[6]{3}\,z^{7/6}}{71680\times 2^{5/6}\sqrt[4]{h}}-\frac{\sqrt{\frac{3}{5}}\,\sqrt[6]{\frac{1}{z}}\,z^{2/3}}{32\sqrt[4]{h}}+\frac{2^{5/6}\sqrt[6]{\frac{1}{z}}}{\sqrt[6]{3}\,\sqrt[4]{h}}$$

Alternate form assuming h and z are positive

$$-\frac{363\sqrt[6]{3}\,z^{7/6}}{71680\times 2^{5/6}\sqrt[4]{h}}+\frac{40\sqrt[6]{2}\,3^{5/6}-\frac{3\sqrt{15}\,z^{2/3}}{4\times 2^{2/3}}}{60\sqrt[3]{2}\,\sqrt[4]{h}\,\sqrt[6]{z}}+\frac{z^{13/6}}{256\sqrt{2}\,\sqrt[6]{3}\,\sqrt[4]{h}}$$

Derivative

$$\frac{\partial}{\partial z}\left(\frac{1}{26880\sqrt[4]{h}\times 16}\sqrt[6]{\frac{16}{z}}\left(8960\sqrt[6]{2}\times 3^{5/6}z\left(\frac{z}{16}\right)^{4/3}-1089\times 2^{5/6}\sqrt[6]{3}\,z\sqrt[3]{\frac{z}{16}}+224\left(40\sqrt[6]{2}\times 3^{5/6}-3\sqrt{15}\left(\frac{z}{16}\right)^{2/3}\right)\times 16\right)\right)=\frac{1}{122880\times 3^{5/6}\sqrt[4]{h}}\left(\frac{1}{z}\right)^{7/6}\left(520\sqrt{2}\times 3^{2/3}z^{7/3}-20480\times 2^{5/6}\times 3^{2/3}-1089\sqrt[6]{2}\,z^{4/3}-1152\sqrt[3]{3}\,\sqrt{5}\,z^{2/3}\right)$$

From the exact result

$$\frac{\sqrt[6]{\frac{1}{z}}\left(140\times 6^{5/6}\,z^{7/3}-\frac{1089\sqrt[6]{3}\,z^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\,3^{5/6}-\frac{3\sqrt{15}\,z^{2/3}}{4\times 2^{2/3}}\right)\right)}{215040\sqrt[3]{2}\,\sqrt[4]{h}}$$

((1/z)^(1/6) (140 6^(5/6) z^(7/3) - (1089 3^(1/6) z^(4/3))/sqrt(2) + 3584 (40 2^(1/6) 3^(5/6) - (3 sqrt(15) z^(2/3))/(4 2^(2/3)))))/(215040 2^(1/3) h^(1/4))

for h = 0.2, z = 15000:

((1/15000)^(1/6) (140 6^(5/6) 15000^(7/3) - (1089 3^(1/6) 15000^(4/3))/sqrt(2) + 3584 (40 2^(1/6) 3^(5/6) - (3 sqrt(15) 15000^(2/3))/(4 2^(2/3)))))/(215040 2^(1/3) 0.2^(1/4))

Input

$$\frac{1}{215040\sqrt[3]{2}\,\sqrt[4]{0.2}}\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\times 15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\times 3^{5/6}-\frac{3\sqrt{15}\times 15000^{2/3}}{4\times 2^{2/3}}\right)\right)$$

Result

$3.842568663579864919184590461338291046508206785946340359558 28\ldots \times 10^6$

3842568.6635798649…

From which, after some calculations:

2Pi(((1/15000)^(1/6) (140 6^(5/6) 15000^(7/3)-(1089 3^(1/6) 15000^(4/3))/sqrt(2)+3584(40 2^(1/6) 3^(5/6)-(3sqrt(15) 15000^(2/3))/(4 2^(2/3)))))/(215040 2^(1/3) 0.2^(1/4)))^(1/e)+8^2+Pi+1/((5+√5)/2)

Input

$$2\pi\left(\left(\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\times 15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\times 3^{5/6}-\frac{3\sqrt{15}\times 15000^{2/3}}{4\times 2^{2/3}}\right)\right)\right)\Big/\left(215040\sqrt[3]{2}\,\sqrt[4]{0.2}\right)\right)\wedge(1/e)+8^2+\pi+\frac{1}{\frac{1}{2}\left(5+\sqrt{5}\right)}$$

Result

1729.019182915698462769681586479845569451492168144374717299348911 8

…

1729.019182915….

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 $1728 = 8^2 \times 3^3$. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number, as it can be expressed as the sum of two cubes in two different ways $10^3 + 9^3 = 12^3 + 1^3 = 1729$ and Ramanujan's recurring number). Since bosons are made of gauge bosons and scalar bosons (meson), then this number theoretic analysis perhaps confirms that the number 1729, confirm the fact that both the gauge and scalar bosons are actually different states of a single bosonic string, and that these states are isomorphic or that the states vibrations are synchronised with the state of the bosonic string. This also imply that each state lives inside a cubic or octahedron as a spherical cloud, and that the total sum of these two states is the state of the bosonic string. Taking the cross section of the bosonic string, we realise that it must be a rectangular, or a two shaped octahedron. As the string vibrates in difference frequencies, so is the two spherical cloud states inside the string. That is, the string vibrations simply excites the gauge bosons i.e Photon, gluon, W and Z inside one cube/octahedron, and the scalar boson i.e. Higgs inside the other cube/octahedron.

Furthermore, if we bring the picture of loop quantum gravity (LQG) with the property of a discontinues quantum geometry, we can therefore, think of the graviton living on the vertices of the rectangles or the octahedrons. This graviton then acts a glue binding the bosonic strings lattice together forming a complete cross section of alternating states of between the gauge bosons and scalar bosons. This arrangement of states then gives a precise supersymmetric quantum picture of the vacuum geometry at low entropy.

But the geometry further reveals very important fact, that since the vacuum geometry is discontinues, then we observe that there is no relation whatsoever between the quantum vibrational frequencies of the strings, and that of the vertices of the vacuum geometry where the graviton lives. Ashtekar et al., (2021) asserted that gravity is simply a manifestation of spacetime geometry. Thus, the graviton cannot be a string boson, however, there is a duality between gravity and strings. Also, gauge bosons have spin-1, while the graviton has spin-2. Then lastly, because of the thermodynamic constraints we were able to arrive at the results we have, now this bring us to this fundamental question; that string theory and LQG theory are two intrinsic aspects of a complete quantum gravity theory we are after? That is, without the other no complete and compelling quantum geometry can be attained, as it is done here? This need to be investigated further.

Series representations

$$2\pi\left(\left(\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\;15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-\frac{3\sqrt{15}\;15000^{2/3}}{4\times 2^{2/3}}\right)\right)\right)\Big/\left(215040\sqrt[3]{2}\;\sqrt[4]{0.2}\right)\right)\wedge(1/e)+8^2+\pi+\frac{1}{\frac{1}{2}\left(5+\sqrt{5}\right)}=$$

$$\left(322+5\pi+64\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+10\pi\left(3.84295\times 10^6-\frac{537.693}{\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}-1.14464\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(15-z_0)^k z_0^{-k}}{k!}\right)\wedge(1/e)+2\pi\sqrt{z_0}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)\left(3.84295\times 10^6-\frac{537.693}{\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}-1.14464\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(15-z_0)^k z_0^{-k}}{k!}\right)\wedge(1/e)\right)\Big/\left(5+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)\text{ for}$$

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

$$2\pi\left(\left(\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\;15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-\frac{3\sqrt{15}\;15000^{2/3}}{4\times 2^{2/3}}\right)\right)\right)\Big/\left(215040\sqrt[3]{2}\;\sqrt[4]{0.2}\right)\right)\wedge(1/e)+8^2+\pi+\frac{1}{\frac{1}{2}\left(5+\sqrt{5}\right)}=$$

$$\left(322+5\pi+64\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+\pi\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}+10\sqrt[e]{1.11139\times 10^{-6}}\,\pi\left(945000000000\times 2^{5/6}\sqrt[6]{3}\;\sqrt[3]{5}-\frac{163350000\sqrt{3}\;\sqrt[3]{5}}{\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-75\left(\frac{15}{2}\right)^{2/3}\exp\left(i\pi\left\lfloor\frac{\arg(15-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(15-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\wedge(1/e)+2\sqrt[e]{1.11139\times 10^{-6}}\,\pi\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\left(945000000000\times 2^{5/6}\sqrt[6]{3}\;\sqrt[3]{5}-\frac{163350000\sqrt{3}\;\sqrt[3]{5}}{\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-75\left(\frac{15}{2}\right)^{2/3}\exp\left(i\pi\left\lfloor\frac{\arg(15-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(15-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\wedge(1/e)\right)\Big/\left(5+\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\text{ for}$$

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

$$2\pi\left(\left(\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\;15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-\frac{3\sqrt{15}\;15000^{2/3}}{4\times 2^{2/3}}\right)\right)\right)\Big/\left(215040\sqrt[3]{2}\;\sqrt[4]{0.2}\right)\right)\wedge(1/e)+8^2+\pi+\frac{1}{\frac{1}{2}\left(5+\sqrt{5}\right)}=$$

$$\left(322+5\pi+64\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+10\sqrt[e]{1.11139\times 10^{-6}}\;\pi\left(945000000000\times 2^{5/6}\sqrt[6]{3}\;\sqrt[3]{5}-\frac{163350000\sqrt{3}\;\sqrt[3]{5}\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}z_0^{-1/2-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-75\left(\frac{15}{2}\right)^{2/3}\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(15-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(15-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(15-z_0)^k z_0^{-k}}{k!}\right)\right)\wedge(1/e)+2\sqrt[e]{1.11139\times 10^{-6}}\;\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)\left(945000000000\times 2^{5/6}\sqrt[6]{3}\;\sqrt[3]{5}-\frac{163350000\sqrt{3}\;\sqrt[3]{5}\left(\frac{1}{z_0}\right)^{-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}z_0^{-1/2-1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}+3584\left(40\sqrt[6]{2}\;3^{5/6}-75\left(\frac{15}{2}\right)^{2/3}\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(15-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(15-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(15-z_0)^k z_0^{-k}}{k!}\right)\right)\wedge(1/e)\Bigg)\Big/\left(5+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

(2π(((1/15000)^1/6 (140 6^(5/6) 15000^(7/3)-(1089 3^1/6 15000^(4/3))/√2+3584(40 2^1/6 3^(5/6)-(3√(15) 15000^(2/3))/(4 2^2/3))))/(215040 2^1/3 0.2^1/4))^(1/e)+64+π+1/((5+√5)/2))^1/15

Input

$$\left(2\pi\left(\left(\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\times 15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\times 3^{5/6}-\frac{3\sqrt{15}\times 15000^{2/3}}{4\times\frac{2^2}{3}}\right)\right)\right)\Big/\left(215040\sqrt[3]{2}\ \sqrt[4]{0.2}\right)\right)\text{^}(1/e)+64+\pi+\frac{1}{\frac{1}{2}\left(5+\sqrt{5}\right)}\right)\text{^}(1/15)$$

Result

1.643816436079045328170034621242472528122224584301601511329736143 5…

1.643816436079….

1.643816436079+(MRB const)^(1-1/(4π)+π)

Input interpretation

$$1.643816436079 + C_{\text{MRB}}{}^{1-1/(4\pi)+\pi}$$

C_{MRB} is the MRB constant

Result

1.644939231461…

1.644939231461…. ≈ $\zeta(2) = \pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

(1/27((2π(((1/15000)^1/6 (140 6^(5/6) 15000^(7/3)-(1089 3^1/6 15000^(4/3))/√2+3584(40 2^1/6 3^(5/6)-(3√(15) 15000^(2/3))/(4 2^2/3))))/(215040 2^1/3 0.2^1/4))^(1/e)+64+π+1/((5+√5)/2))-1))^2

Input

$$\left(\frac{1}{27}\left(\left(2\pi\left(\left(\sqrt[6]{\frac{1}{15000}}\left(140\times 6^{5/6}\times 15000^{7/3}-\frac{1089\sqrt[6]{3}\times 15000^{4/3}}{\sqrt{2}}+3584\left(40\sqrt[6]{2}\times 3^{5/6}-\frac{3\sqrt{15}\times 15000^{2/3}}{4\times\frac{2^2}{3}}\right)\right)\right)\Big/\left(215040\sqrt[3]{2}\,\sqrt[4]{0.2}\right)\right)\wedge(1/e)+64+\pi+\frac{1}{\frac{1}{2}\left(5+\sqrt{5}\right)}\right)-1\right)\right)^2$$

Result

4096.090304666089151568764577643823124588163870429168734391992529 4

…

4096.090304666…. ≈ 4096

The number 4096 = 64^2, is the Ramanujan Recurring Number, that when multiplied by 2 give 8192. The total amplitude vanishes for gauge group SO(8192) for bosonic string SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string.

While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, $SO(2^{13})$ i.e. SO(8192). This could be the implications for a pre-big bang scenario where only self-perturbative bosonic strings lived when the enthalpy was extremely low as discussed above. This regime contains all the intrinsic properties of superstrings inherent in the bosonic strings, would at the big bang give effect to the properties of matter (fermions) as Higgs Boson. This number theoretic connection to the gauge group SO(8192), gives a much more compelling relevance of the bosonic string theory SO(8192), to quantum gravity and places this string theory where it should appropriately be in the evolution of the universe from a quantum gravity perspective rather than it be neglected because it doesn't include fermionic strings to confirm to post big-bang reality. The vanishing of the bosonic string's amplitude could be explained by the effect of extreme low entropy on the quantum vacuum geometry. Thus, as the entropy increases infinitesimally as a result of the vacuum self-perturbation then also is the amplitude of the vibrating bosonic strings from zero. Thus, was right to indicate that the "vanishing of the amplitude of the bosonic string could be the results of string theory itself", but here, we give a much more elaborate explanation of what could be happening.

We have also:

(h^(1/4))*((3*z)/(2*z_0))^(1/6)*[1-(1/(4√10))*((3*z)/(2*z_0))^(2/3)+23/2240*((3*z)/(2*z_0))^(4/3)+(z/(z_0))^(7/3)]

Input

$$\sqrt[4]{h}\,\sqrt[6]{\frac{3\,z}{2\,z_0}}\left(1-\frac{1}{4\sqrt{10}}\left(\frac{3\,z}{2\,z_0}\right)^{2/3}+\frac{23}{2240}\left(\frac{3\,z}{2\,z_0}\right)^{4/3}+\left(\frac{z}{z_0}\right)^{7/3}\right)$$

Exact result

$$\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\left(\left(\frac{z}{z_0}\right)^{7/3}+\frac{69\sqrt[3]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{4/3}}{4480}-\frac{3^{2/3}\left(\frac{z}{z_0}\right)^{2/3}}{8\sqrt[6]{2}\,\sqrt{5}}+1\right)\sqrt[6]{\frac{z}{z_0}}$$

Alternate forms

$$\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\,\sqrt[6]{\frac{z}{z_0}}\left(\left(\frac{z}{z_0}\right)^{2/3}\ \text{root of}\ 65\,536\,000\,x^6-81\ \text{near}\ x=-0.103594\ +\left(\frac{z}{z_0}\right)^{7/3}+\frac{69\sqrt[3]{\frac{3}{2}}\left(\frac{z}{z_0}\right)^{4/3}}{4480}+1\right)$$

$$-\frac{1}{8960}\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\left(-8960\left(\frac{z}{z_0}\right)^{7/3}-69\times 2^{2/3}\,\sqrt[3]{3}\left(\frac{z}{z_0}\right)^{4/3}+112\times 2^{5/6}\times 3^{2/3}\,\sqrt{5}\left(\frac{z}{z_0}\right)^{2/3}-8960\right)\sqrt[6]{\frac{z}{z_0}}$$

Expanded form

$$\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\left(\frac{z}{z_0}\right)^{5/2}+\frac{69\sqrt{3}\,\sqrt[4]{h}\left(\frac{z}{z_0}\right)^{3/2}}{4480\sqrt{2}}-\frac{3^{5/6}\,\sqrt[4]{h}\left(\frac{z}{z_0}\right)^{5/6}}{8\sqrt[3]{2}\,\sqrt{5}}+\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\,\sqrt[6]{\frac{z}{z_0}}$$

Alternate form assuming h, z, and z_0 are positive

$$\frac{1}{4480\sqrt{2}}\sqrt[6]{3}\,\sqrt[4]{h}\left(4480\sqrt[3]{2}\left(\frac{z}{z_0}\right)^{7/3}+69\sqrt[3]{3}\left(\frac{z}{z_0}\right)^{4/3}-112\sqrt[6]{2}\,3^{2/3}\sqrt{5}\left(\frac{z}{z_0}\right)^{2/3}+4480\sqrt[3]{2}\right)\sqrt[6]{\frac{z}{z_0}}$$

Series expansion at z=0

$$\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\,\sqrt[6]{\frac{1}{z_0}}\,\sqrt[6]{z}-\frac{z^{5/6}\left(3^{5/6}\,\sqrt[4]{h}\left(\frac{1}{z_0}\right)^{5/6}\right)}{8\left(\sqrt[3]{2}\,\sqrt{5}\right)}+\frac{69\sqrt{3}\,\sqrt[4]{h}\left(\frac{1}{z_0}\right)^{3/2}z^{3/2}}{4480\sqrt{2}}+\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\left(\frac{1}{z_0}\right)^{5/2}z^{5/2}+O\left(z^{31/6}\right)$$

(Puiseux series)

Derivative

$$\frac{\partial}{\partial z}\left(\sqrt[4]{h}\ \sqrt[6]{\frac{3z}{2z_0}}\left(1-\frac{\left(\frac{3z}{2z_0}\right)^{2/3}}{4\sqrt{10}}+\frac{23\left(\frac{3z}{2z_0}\right)^{4/3}}{2240}+\left(\frac{z}{z_0}\right)^{7/3}\right)\right)=$$
$$-\left(\left(\sqrt[4]{h}\left(-621\times 2^{2/3}\sqrt[3]{3}\ z\sqrt[3]{\frac{z}{z_0}}+560\,z_0\left(2^{5/6}\times 3^{2/3}\sqrt{5}\left(\frac{z}{z_0}\right)^{2/3}-16\right)-134400\,z\left(\frac{z}{z_0}\right)^{4/3}\right)\right)\Big/\left(17920\sqrt[6]{2}\times 3^{5/6}\left(\frac{z}{z_0}\right)^{5/6}z_0^2\right)\right)$$

From the expanded form

$$\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{h}\left(\frac{z}{z_0}\right)^{5/2}+\frac{69\sqrt{3}\ \sqrt[4]{h}\left(\frac{z}{z_0}\right)^{3/2}}{4480\sqrt{2}}-\frac{3^{5/6}\sqrt[4]{h}\left(\frac{z}{z_0}\right)^{5/6}}{8\sqrt[3]{2}\ \sqrt{5}}+\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{h}\ \sqrt[6]{\frac{z}{z_0}}$$

(3/2)^(1/6) h^(1/4) (z/z_0)^(1/6) - (3^(5/6) h^(1/4) (z/z_0)^(5/6))/(8 2^(1/3) sqrt(5)) + (69 sqrt(3) h^(1/4) (z/z_0)^(3/2))/(4480 sqrt(2)) + (3/2)^(1/6) h^(1/4) (z/z_0)^(5/2)

for $z_0 = 16$:

(3/2)^(1/6) h^(1/4) (z/16)^(1/6) - (3^(5/6) h^(1/4) (z/16)^(5/6))/(8 2^(1/3) sqrt(5)) + (69 sqrt(3) h^(1/4) (z/16)^(3/2))/(4480 sqrt(2)) + (3/2)^(1/6) h^(1/4) (z/16)^(5/2)

Input

$$\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{h}\ \sqrt[6]{\frac{z}{16}}-\frac{3^{5/6}\sqrt[4]{h}\left(\frac{z}{16}\right)^{5/6}}{8\sqrt[3]{2}\ \sqrt{5}}+\frac{69\sqrt{3}\ \sqrt[4]{h}\left(\frac{z}{16}\right)^{3/2}}{4480\sqrt{2}}+\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{h}\left(\frac{z}{16}\right)^{5/2}$$

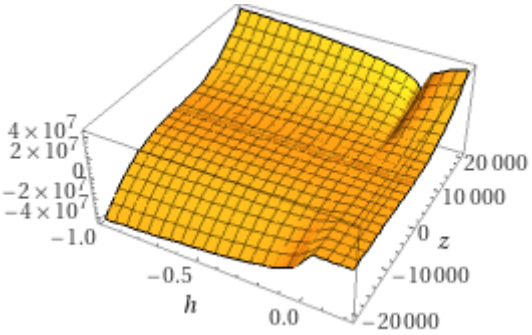
Exact result

$$\frac{\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{h}\ z^{5/2}}{1024}-\frac{3^{5/6}\sqrt[4]{h}\ z^{5/6}}{64\times 2^{2/3}\sqrt{5}}+\frac{69\sqrt{3}\ \sqrt[4]{h}\ z^{3/2}}{286720\sqrt{2}}+\frac{\sqrt[6]{3}\ \sqrt[4]{h}\ \sqrt[6]{z}}{2^{5/6}}$$

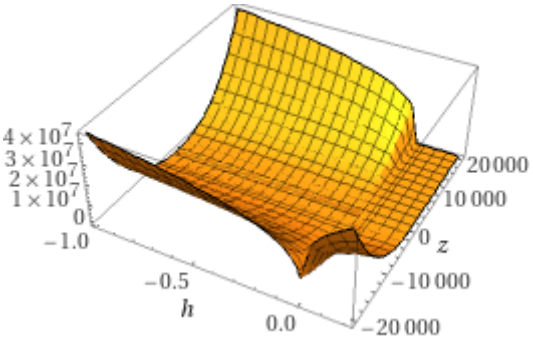
3D plots

Real part **(figures that can be related to the D-branes/Instantons)**

The key observation from the below plots and is that at $z = 1$, which is taken as the energy density of the universe at the Big Bang, with $h = 0$ the zero spacetime volume, the vacuum geometry brakes / or there is symmetry breaking on the vacuum quantum geometry. We see from the plots as the vacuum spacetime break/tear apart.

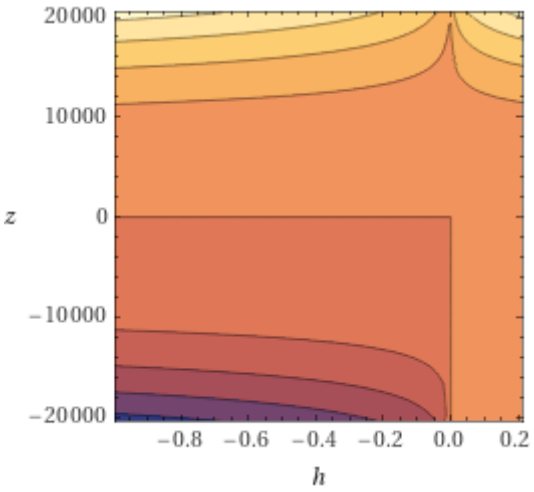


Imaginary part

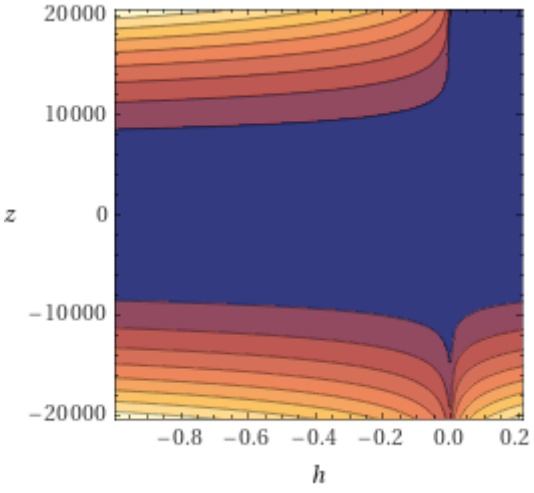


Contour plots

Real part



Imaginary part



Alternate forms

$$\frac{\sqrt[6]{3}\ \sqrt[4]{h}\ \sqrt[6]{z}\left(280\times 2^{2/3}\ z^{7/3}+69\sqrt[3]{6}\ z^{4/3}-896\sqrt[6]{2}\ 3^{2/3}\sqrt{5}\ z^{2/3}+286\,720\right)}{286\,720\times 2^{5/6}}$$

$$\sqrt[4]{h}\left(\frac{\sqrt[6]{\frac{3}{2}}\ z^{5/2}}{1024}-\frac{3^{5/6}\ z^{5/6}}{64\times 2^{2/3}\sqrt{5}}+\frac{69\sqrt{\frac{3}{2}}\ z^{3/2}}{286\,720}+\frac{\sqrt[6]{3}\ \sqrt[6]{z}}{2^{5/6}}\right)$$

Derivative

$$\frac{\partial}{\partial z}\left(\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\,\sqrt[6]{\frac{z}{16}}-\frac{3^{5/6}\,\sqrt[4]{h}\,\left(\frac{z}{16}\right)^{5/6}}{8\,\sqrt[3]{2}\,\sqrt{5}}+\frac{69\,\sqrt{3}\,\sqrt[4]{h}\,\left(\frac{z}{16}\right)^{3/2}}{4480\,\sqrt{2}}+\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\,\left(\frac{z}{16}\right)^{5/2}\right)=$$
$$\frac{\sqrt[4]{h}\,\left(4200\times 2^{2/3}\,z^{7/3}-4480\,\sqrt[6]{2}\times 3^{2/3}\,\sqrt{5}\,z^{2/3}+621\,\sqrt[3]{6}\,z^{4/3}+286\,720\right)}{573\,440\times 6^{5/6}\,z^{5/6}}$$

From the exact result

$$\frac{\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{h}\,z^{5/2}}{1024}-\frac{3^{5/6}\,\sqrt[4]{h}\,z^{5/6}}{64\times 2^{2/3}\,\sqrt{5}}+\frac{69\,\sqrt{3}\,\sqrt[4]{h}\,z^{3/2}}{286\,720\,\sqrt{2}}+\frac{\sqrt[6]{3}\,\sqrt[4]{h}\,\sqrt[6]{z}}{2^{5/6}}$$

(3^(1/6) h^(1/4) z^(1/6))/2^(5/6) - (3^(5/6) h^(1/4) z^(5/6))/(64 2^(2/3) sqrt(5)) + (69 sqrt(3) h^(1/4) z^(3/2))/(286720 sqrt(2)) + ((3/2)^(1/6) h^(1/4) z^(5/2))/1024

for h = 0.2 and z = 15000:

(3^(1/6) 0.2^(1/4) 15000^(1/6))/2^(5/6) - (3^(5/6) 0.2^(1/4) 15000^(5/6))/(64 2^(2/3) sqrt(5)) + (69 sqrt(3) 0.2^(1/4) 15000^(3/2))/(286720 sqrt(2)) + ((3/2)^(1/6) 0.2^(1/4) 15000^(5/2))/1024

Input

$$\frac{\sqrt[6]{3}\,\sqrt[4]{0.2}\,\sqrt[6]{15\,000}}{2^{5/6}}-\frac{3^{5/6}\,\sqrt[4]{0.2}\times 15\,000^{5/6}}{64\times 2^{2/3}\,\sqrt{5}}+$$
$$\frac{69\,\sqrt{3}\,\sqrt[4]{0.2}\times 15\,000^{3/2}}{286\,720\,\sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{0.2}\times 15\,000^{5/2}}{1024}$$

Result

$1.92549302550682055325456143983517247691134057165053570616467\ldots\times 10^{7}$

19254930.2550682….

From which:

7((3^(1/6) 0.2^(1/4) 15000^(1/6))/2^(5/6)-(3^(5/6) 0.2^(1/4) 15000^(5/6))/(64 2^(2/3) sqrt(5)) + (69 sqrt(3) 0.2^(1/4) 15000^(3/2))/(286720 sqrt(2))+((3/2)^(1/6) 0.2^(1/4) 15000^(5/2))/1024)^1/3-144-π

Input

$$7\left(\frac{\sqrt[6]{3}\,\sqrt[4]{0.2}\,\sqrt[6]{15000}}{2^{5/6}}-\frac{3^{5/6}\,\sqrt[4]{0.2}\times 15000^{5/6}}{64\times 2^{2/3}\,\sqrt{5}}+\frac{69\,\sqrt{3}\,\sqrt[4]{0.2}\times 15000^{3/2}}{286720\,\sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{0.2}\times 15000^{5/2}}{1024}\right)\text{^}(1/3)-144-\pi$$

Result

1729.056499341073867604434100983637144154007881952241851046563922 4

…

1729.056499341….

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 $1728 = 8^2 \times 3^3$. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number, as it can be expressed as the sum of two cubes in two different ways $10^3 + 9^3 = 12^3 + 1^3 = 1729$ and Ramanujan's recurring number). Since bosons are made of gauge bosons and scalar bosons (meson), then this number theoretic analysis perhaps confirms that the number 1729, confirm the fact that both the gauge and scalar bosons are actually different states of a single bosonic string, and that these states are isomorphic or that the states vibrations are synchronised with the state of the bosonic string. This also imply that each state lives inside a cubic or octahedron as a spherical cloud, and that the total sum of these two states is the state of the bosonic string. Taking the cross section of the bosonic string, we realise that it must be a rectangular, or a two shaped octahedron. As the string vibrates in difference frequencies, so is the two spherical cloud states inside the string. That is, the string vibrations simply excites the gauge bosons i.e Photon, gluon, W and Z inside one cube/octahedron, and the scalar boson i.e. Higgs inside the other cube/octahedron.

Furthermore, if we bring the picture of loop quantum gravity (LQG) with the property of a discontinues quantum geometry, we can therefore, think of the graviton living on the vertices of the rectangles or the octahedrons. This graviton then acts a glue binding the bosonic strings lattice together forming a complete cross section of alternating states of between the gauge bosons and scalar bosons. This arrangement of states then gives a precise supersymmetric quantum picture of the vacuum geometry at low entropy.

But the geometry further reveals very important fact, that since the vacuum geometry is discontinues, then we observe that there is no relation whatsoever between the quantum vibrational frequencies of the strings, and that of the vertices of the vacuum geometry where the graviton lives. Ashtekar et al., (2021) asserted that gravity is simply a manifestation of spacetime geometry. Thus, the graviton cannot be a string boson, however, there is a duality between gravity and strings. Also, gauge bosons have spin-1, while the graviton has spin-2. Then lastly, because of the thermodynamic constraints we were able to arrive at the results we have, now this bring us to this fundamental question; that string theory and LQG theory are two intrinsic aspects of a complete quantum gravity theory we are after? That is, without the other no complete and compelling quantum geometry can be attained, as it is done here? This need to be investigated further.

Series representations

$$7\left(\frac{\sqrt[6]{3}\left(\sqrt[4]{0.2}\ \sqrt[6]{15000}\right)}{2^{5/6}}-\frac{3^{5/6}\sqrt[4]{0.2}\ 15000^{5/6}}{64\times 2^{2/3}\sqrt{5}}+\frac{69\left(\sqrt{3}\ \sqrt[4]{0.2}\ 15000^{3/2}\right)}{286720\sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\left(\sqrt[4]{0.2}\ 15000^{5/2}\right)}{1024}\right)\text{^}(1/3)-144-\pi=$$

$$-144-\pi+7\left(1.92546\times 10^{7}+\frac{295.655\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}-\frac{49.667}{\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}}\right)\text{^}(1/3)$$

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

$$7\left(\frac{\sqrt[6]{3}\left(\sqrt[4]{0.2}\ \sqrt[6]{15000}\right)}{2^{5/6}}-\frac{3^{5/6}\sqrt[4]{0.2}\ 15000^{5/6}}{64\times 2^{2/3}\sqrt{5}}+\frac{69\left(\sqrt{3}\ \sqrt[4]{0.2}\ 15000^{3/2}\right)}{286720\sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\left(\sqrt[4]{0.2}\ 15000^{5/2}\right)}{1024}\right)\text{^}(1/3)-144-\pi=-144-\pi+$$

$$7\left(1.92546\times 10^{7}+\frac{295.655\exp\left(i\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}-\frac{49.667}{\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\right)\text{^}(1/3)$$

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

$$7\left(\frac{\sqrt[6]{3}\left(\sqrt[4]{0.2}\ \sqrt[6]{15\,000}\right)}{2^{5/6}}-\frac{3^{5/6}\ \sqrt[4]{0.2}\ 15\,000^{5/6}}{64\times 2^{2/3}\ \sqrt{5}}+\frac{69\left(\sqrt{3}\ \sqrt[4]{0.2}\ 15\,000^{3/2}\right)}{286\,720\ \sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\left(\sqrt[4]{0.2}\ 15\,000^{5/2}\right)}{1024}\right)\text{^}(1/3)-144-\pi=$$

$$-144-\pi+7\left(1.92546\times 10^{7}+\left(295.655\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}z_0^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k\ z_0^{-k}}{k!}\right)\Big/\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\ z_0^{-k}}{k!}\right)-\frac{49.667\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}\ z_0^{-1/2-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\ z_0^{-k}}{k!}}\right)\text{^}(1/3)$$

(7((3^(1/6) 0.2^(1/4)15000^(1/6))/2^(5/6)-(3^(5/6) 0.2^(1/4) 15000^(5/6))/(64 2^(2/3) √(5)) + (69 sqrt(3) 0.2^(1/4) 15000^(3/2))/(286720 √(2))+((3/2)^(1/6) 0.2^(1/4) 15000^(5/2))/1024)^1/3-144-π)^1/15

Input

$$\left(7\left(\frac{\sqrt[6]{3}\ \sqrt[4]{0.2}\ \sqrt[6]{15\,000}}{2^{5/6}}-\frac{3^{5/6}\ \sqrt[4]{0.2}\times 15\,000^{5/6}}{64\times 2^{2/3}\ \sqrt{5}}+\frac{69\ \sqrt{3}\ \sqrt[4]{0.2}\times 15\,000^{3/2}}{286\,720\ \sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{0.2}\times 15\,000^{5/2}}{1024}\right)\text{^}(1/3)-144-\pi\right)\text{^}(1/15)$$

Result

1.643818809742019566478106952119407184060646682262096656430398712 2…

1.643818809742....

All 15th roots of 1729.06

$1.64382\, e^{0} \approx 1.6438$ (real, principal root)

$1.64382\, e^{(2i\pi)/15} \approx 1.5017 + 0.66860\, i$

$1.64382\, e^{(4i\pi)/15} \approx 1.0999 + 1.2216\, i$

$1.64382\, e^{(2i\pi)/5} \approx 0.50797 + 1.5634\, i$

$1.64382\, e^{(8i\pi)/15} \approx -0.17183 + 1.6348\, i$

(1.643818809742)+(MRB const)^(1-1/(4π)+π)

Input interpretation

$1.643818809742 + C_{\text{MRB}}{}^{1-1/(4\pi)+\pi}$

C_{MRB} is the MRB constant

Result

1.644941605124…

1.644941605124…. ≈ ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

(1/27(((7((3^(1/6)0.2^(1/4)15000^(1/6))/2^(5/6)-(3^(5/6)0.2^(1/4)15000^(5/6))/(64 2^(2/3)√(5))+(69√(3) 0.2^(1/4)15000^(3/2))/(286720√(2))+((3/2)^(1/6)0.2^(1/4)15000^(5/2))/1024)^1/3-144-π))-1))^2-1/π

Input

$$\left(\frac{1}{27}\left(\left(7\left(\frac{\sqrt[6]{3}\,\sqrt[4]{0.2}\,\sqrt[6]{15\,000}}{2^{5/6}}-\frac{3^{5/6}\,\sqrt[4]{0.2}\times 15\,000^{5/6}}{64\times 2^{2/3}\,\sqrt{5}}+\frac{69\,\sqrt{3}\left(\sqrt[4]{0.2}\times 15\,000^{3/2}\right)}{286\,720\,\sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\,\sqrt[4]{0.2}\times 15\,000^{5/2}}{1024}\right)\wedge\left((1/3)-144-\pi\right)-1\right)\right)^2-\frac{1}{\pi}$$

Result

4095.950…

4095.95…. ≈ 4096

The number 4096 = 64^2, is the Ramanujan Recurring Number, that when multiplied by 2 give 8192. The total amplitude vanishes for gauge group SO(8192) for bosonic string SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, SO(2^{13}) i.e. SO(8192). This could be the implications for a pre-big bang scenario where only self-perturbative bosonic strings lived when the enthalpy was extremely low as discussed above. This regime contains all the intrinsic properties of superstrings inherent in the bosonic strings, would at the big bang give effect to the properties of matter (fermions) as Higgs Boson.

This number theoretic connection to the gauge group SO(8192), gives a much more compelling relevance of the bosonic string theory SO(8192), to quantum gravity and places this string theory where it should appropriately be in the evolution of the universe from a quantum gravity perspective rather than it be neglected because it doesn't include fermionic strings to confirm to post big-bang reality. The vanishing of the bosonic string's amplitude could be explained by the effect of extreme low entropy on the quantum vacuum geometry. Thus, as the entropy increases infinitesimally as a result of the vacuum self-perturbation then also is the amplitude of the vibrating bosonic strings from zero. Thus, was right to indicate that the "vanishing of the amplitude of the bosonic string could be the results of string theory itself", but here, we give a much more elaborate explanation of what could be happening.

Series representations

$$\left(\frac{1}{27}\left(\left(7\left(\frac{\sqrt[6]{3}\ \sqrt[4]{0.2}\ \sqrt[6]{15000}}{2^{5/6}}-\frac{3^{5/6}\ \sqrt[4]{0.2}\ 15000^{5/6}}{64\times 2^{2/3}\ \sqrt{5}}+\frac{69\sqrt{3}\ \left(\sqrt[4]{0.2}\ 15000^{3/2}\right)}{286720\sqrt{2}}+\frac{\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{0.2}\ 15000^{5/2}}{1024}\right)\wedge(1/3)-144-\pi\right)-1\right)\right)^2-\frac{1}{\pi}=\frac{1}{729\pi}\left(-729+21025\pi+290\pi^2+\pi^3-2030\pi\left(1.92546\times 10^7+\frac{295.655\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}-\frac{49.667}{\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}}\right)\wedge(1/3)-14\pi^2\left(1.92546\times 10^7+\frac{295.655\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}-\frac{49.667}{\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}}\right)\wedge(1/3)+49\pi\left(1.92546\times 10^7+\frac{295.655\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k z_0^{-k}}{k!}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}-\frac{49.667}{\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}}\right)^{2/3}\right)$$

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

$$\left(\frac{1}{27}\left(\left(7\left(\frac{\sqrt[6]{3}\ \sqrt[4]{0.2}\ \sqrt[6]{15\,000}}{2^{5/6}}-\frac{3^{5/6}\ \sqrt[4]{0.2}\ 15\,000^{5/6}}{64\times 2^{2/3}\ \sqrt{5}}+\frac{69\ \sqrt{3}\ \left(\sqrt[4]{0.2}\ 15\,000^{3/2}\right)}{286\,720\ \sqrt{2}}+\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\frac{\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{0.2}\ 15\,000^{5/2}}{1024}\right)\text{^}(1/3)-144-\pi\right)-1\right)\right)^2-$$

$$\frac{1}{\pi}=\frac{1}{729\,\pi}\left(-729+21\,025\,\pi+290\,\pi^2+\pi^3-2030\,\pi\right.$$

$$\left(1.92546\times 10^7+\frac{295.655\exp\left(i\,\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}-\right.$$

$$\left.\frac{49.667}{\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\right)\text{^}(1/3)-14\,\pi^2$$

$$\left(1.92546\times 10^7+\frac{295.655\exp\left(i\,\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}-\right.$$

$$\left.\frac{49.667}{\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\right)\text{^}(1/3)+49\,\pi$$

$$\left.\left(1.92546\times 10^7+\frac{295.655\exp\left(i\,\pi\left\lfloor\frac{\arg(3-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(3-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}-\right.\right.$$

$$\left.\left.\frac{49.667}{\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\right)^{2/3}\right)$$

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

$$\left(\frac{1}{27}\left(\left(7\left(\frac{\sqrt[6]{3}\ \sqrt[4]{0.2}\ \sqrt[6]{15000}}{2^{5/6}}-\frac{3^{5/6}\ \sqrt[4]{0.2}\ 15000^{5/6}}{64\times 2^{2/3}\ \sqrt{5}}+\frac{69\sqrt{3}\left(\sqrt[4]{0.2}\ 15000^{3/2}\right)}{286720\sqrt{2}}+\right.\right.\right.\right.$$

$$\left.\left.\left.\left.\frac{\sqrt[6]{\frac{3}{2}}\ \sqrt[4]{0.2}\ 15000^{5/2}}{1024}\right)\text{^}(1/3)-144-\pi\right)-1\right)\right)^2-$$

$$\frac{1}{\pi}=\frac{1}{729\pi}\left(-729+21025\pi+290\pi^2+\pi^3-2030\pi\right.$$

$$\left(1.92546\times 10^7+\left(295.655\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}\right.\right.$$

$$z_0^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k\ z_0^{-k}}{k!}\right)\Big/$$

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

$$\left.\left.\frac{49.667\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}\ z_0^{-1/2-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\ z_0^{-k}}{k!}}\right)\text{^}(1/3)-\right.$$

$$14\pi^2\left(1.92546\times 10^7+\left(295.655\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}\right.\right.$$

$$z_0^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k\ z_0^{-k}}{k!}\right)\Big/$$

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

$$\left.\left.\frac{49.667\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}\ z_0^{-1/2-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\ z_0^{-k}}{k!}}\right)\text{^}(1/3)+\right.$$

$$49\pi\left(1.92546\times 10^7+\left(295.655\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}\right.\right.$$

$$z_0^{-1/2\lfloor \arg(2-z_0)/(2\pi)\rfloor+1/2\lfloor \arg(3-z_0)/(2\pi)\rfloor}$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(3-z_0)^k\ z_0^{-k}}{k!}\right)\Big/$$

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

$$\left.\left.\left.\frac{49.667\left(\frac{1}{z_0}\right)^{-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}\ z_0^{-1/2-1/2\lfloor \arg(5-z_0)/(2\pi)\rfloor}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\ z_0^{-k}}{k!}}\right)^{2/3}\right)\right)$$

The general "unitary" formula, which derives from DN Constant, is the following:

$$\sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi \cdot 1 - \frac{e^{(-\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-2\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-3\pi \cdot \sqrt{5})}}{1 + \frac{e^{(-4\pi \cdot \sqrt{5})}}{1}}}}} (3842568.6635798649 \times R \times 2.33 \cdot 10^{-13})}} \approx$$

$$\approx \sqrt{2 \times \frac{2 \cdot \sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi \cdot 0.9991104684} (C \times \mathrm{R} \times 2.33 \cdot 10^{-13})}} \cong 1.61803398 \ldots = \frac{\sqrt{5}+1}{2}$$

Where $\frac{2\sqrt{2}}{\pi}$ is the Del Gaudio-Nardelli Constant, 0.9991104684 is the value of the following Rogers-Ramanujan continued fraction:

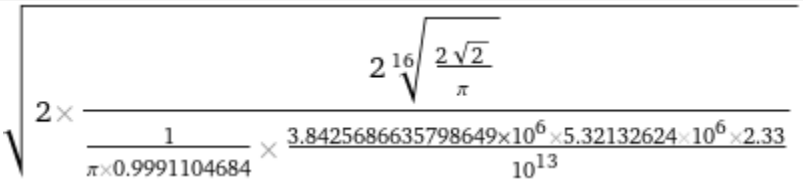
$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5 \sqrt[4]{5^3}}-1}} - \varphi + 1} = 1 - \frac{e^{-\pi\sqrt{5}}}{1 + \frac{e^{-2\pi\sqrt{5}}}{1 + \frac{e^{-3\pi\sqrt{5}}}{1 + \frac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}} \approx 0.9991104684$$

C is any constant or solution to an equation, R is the radius of the Universe and $2.33*10^{-13}$ is the temperature of the universe expressed in GeV.

From the previous result, for $C = 3842568.6635798649$, inserting a radius of the Universe, which we have calculated, equal to $R = 5.32132624 \times 10^6$ years, from DN Constant "unitary" formula, we obtain:

√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (3842568.6635798649×(5.32132624 × 10^6)×2.33·10^(-13))))

Input interpretation



Result

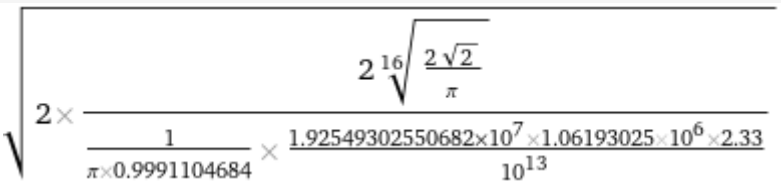
1.6180346309593825711251427944139490670430188495350847776062287136 …

1.618034630959…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

While for C = 19254930.2550682 and R = 1.06193025×10^6 , we obtain:

√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (19254930.2550682×(1.06193025 × 10^6)×2.33·10^(-13))))

Input interpretation



Result

1.6180413001166256269530659082440366235298332969353456936560353506 …

1.6180413001166…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

Furthermore, from the two results, after some calculations, we obtain also:

16(2*(19254930.2550682/3842568.6635798649)^3)+64+2e+MRB const

Input interpretation

$$16\left(2\left(\frac{1.92549302550682\times 10^7}{3.8425686635798649\times 10^6}\right)^3\right)+64+2\,e+C_{\text{MRB}}$$

C_{MRB} is the MRB constant

Result

4095.96880004549…

4095.9688…. ≈ 4096

The number 4096 = 64^2, is the Ramanujan Recurring Number, that when multiplied by 2 give 8192. The total amplitude vanishes for gauge group SO(8192) for bosonic string SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, SO(2^{13}) i.e. SO(8192). This could be the implications for a pre-big bang scenario where only self-perturbative bosonic strings lived when the enthalpy was extremely low as discussed above. This regime contains all the intrinsic properties of superstrings inherent in the bosonic strings, would at the big bang give effect to the properties of matter (fermions) as Higgs Boson. This number theoretic connection to the gauge group SO(8192), gives a much more compelling relevance of the bosonic string theory SO(8192), to quantum gravity and places this string theory where it should appropriately be in the evolution of the universe from a quantum gravity perspective rather than it be neglected because it doesn't include fermionic strings to confirm to post big-bang reality. The vanishing of the bosonic string's amplitude could be explained by the effect of extreme low entropy on the quantum vacuum geometry. Thus, as the entropy increases infinitesimally as a result of the vacuum self-perturbation then also is the amplitude of the vibrating bosonic strings from zero. Thus, was right to indicate that the "vanishing of the amplitude of the bosonic string could be the results of string theory itself", but here, we give a much more elaborate explanation of what could be happening.

27*sqrt(16(2*(19254930.2550682/3842568.6635798649)^3)+64+2e+MRB const)+1

Input interpretation

$$27\sqrt{16\left(2\left(\frac{1.92549302550682\times 10^7}{3.8425686635798649\times 10^6}\right)^3\right)+64+2\,e+C_{\text{MRB}}}+1$$

C_{MRB} is the MRB constant

Result

1728.99341874706…

1728.9934187….

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 $1728 = 8^2 \times 3^3$. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number, as it can be expressed as the sum of two cubes in two different ways $10^3 + 9^3 = 12^3 + 1^3 = 1729$ and Ramanujan's recurring number). Since bosons are made of gauge bosons and scalar bosons (meson), then this number theoretic analysis perhaps confirms that the number 1729, confirm the fact that both the gauge and scalar bosons are actually different states of a single bosonic string, and that these states are isomorphic or that the states vibrations are synchronised with the state of the bosonic string. This also imply that each state lives inside a cubic or octahedron as a spherical cloud, and that the total sum of these two states is the state of the bosonic string. Taking the cross section of the bosonic string, we realise that it must be a rectangular, or a two shaped octahedron. As the string vibrates in difference frequencies, so is the two spherical cloud states inside the string. That is, the string vibrations simply excites the gauge bosons i.e Photon, gluon, W and Z inside one cube/octahedron, and the scalar boson i.e. Higgs inside the other cube/octahedron.

Furthermore, if we bring the picture of loop quantum gravity (LQG) with the property of a discontinues quantum geometry, we can therefore, think of the graviton living on the vertices of the rectangles or the octahedrons. This graviton then acts a glue binding the bosonic strings lattice together forming a complete cross section of alternating states of between the gauge bosons and scalar bosons. This arrangement of states then gives a precise supersymmetric quantum picture of the vacuum geometry at low entropy.

But the geometry further reveals very important fact, that since the vacuum geometry is discontinues, then we observe that there is no relation whatsoever between the quantum vibrational frequencies of the strings, and that of the vertices of the vacuum geometry where the graviton lives. Ashtekar et al., (2021) asserted that gravity is simply a manifestation of spacetime geometry. Thus, the graviton cannot be a string boson, however, there is a duality between gravity and strings. Also, gauge bosons have spin-1, while the graviton has spin-2. Then lastly, because of the thermodynamic constraints we were able to arrive at the results we have, now this bring us to this fundamental question; that string theory and LQG theory are two intrinsic aspects of a complete quantum gravity theory we are after? That is, without the other no complete and compelling quantum geometry can be attained, as it is done here? This need to be investigated further.

(27*sqrt(16(2*(19254930.2550682/3842568.6635798649)^3)+64+2e+MRB const)+1)^1/15+(MRB const)^(1-1/(4π)+π)

Input interpretation

$$\sqrt[15]{27\sqrt{16\left(2\left(\frac{1.92549302550682\times 10^7}{3.8425686635798649\times 10^6}\right)^3\right)+64+2\,e+C_{\text{MRB}}}+1+C_{\text{MRB}}^{\,1-1/(4\pi)+\pi}}$$

C_{MRB} is the MRB constant

Result

1.644937606995769…

1.644937606995769…. ≈ ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

On the application of the formulas of the volumes of an octahedron and a sphere

With regard to a sphere inscribed in an octahedron, we have the following formulas.

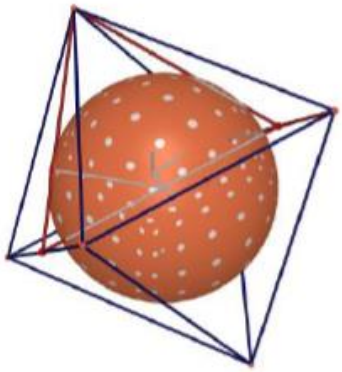


Fig: sphere inscribed in an octahedron

$V_0 = \frac{1}{3}\sqrt{2}\,l^3$

$V_s = \frac{4}{3}\pi r^3$; where $r_s = (l/2)$

With regard the ratio between the two above formulas (octahedron and sphere)

(1/3*√2*l^3)/(4/3*π*(l/2)^3)

we obtain:

Input

$$\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}$$

Result

$$\frac{\sqrt{2}\,2}{\pi} \quad (\text{for } l \neq 0)$$

Decimal approximation

0.900316316157106069555199191006740582664574149955220625571437471 2

…

0.900316316157106…. = $\frac{2\sqrt{2}}{\pi}$ (DN Constant)

Property

$\frac{2\sqrt{2}}{\pi}$ is a transcendental number

Series representations

$$\frac{\sqrt{2}\,l^3}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = \frac{2\sqrt{z_0}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}}{\pi} \quad \text{for } (\text{not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$$

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

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

$$\frac{\sqrt{2}\,l^3}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = \frac{2\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,z_0^{1/2(1+\lfloor\arg(2-z_0)/(2\pi)\rfloor)}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}}{\pi}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

From which:

1/3*(2/((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^2

Input

$$\frac{1}{3}\left(\frac{2}{\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}}\right)^2$$

Result

$$\frac{\pi^2}{6}$$

Decimal approximation

1.64493406684822643647241516664602518921894990120679843773555822 93…

1.644934066848226… = ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

Property

$\frac{\pi^2}{6}$ is a transcendental number

Series representations

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \sum_{k=1}^{\infty}\frac{1}{k^2}$$

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = -2\sum_{k=1}^{\infty}\frac{(-1)^k}{k^2}$$

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

Integral representations

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \frac{8}{3}\left(\int_0^1\sqrt{1-t^2}\,dt\right)^2$$

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \frac{2}{3}\left(\int_0^{\infty}\frac{1}{1+t^2}\,dt\right)^2$$

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2=\frac{2}{3}\left(\int_0^1\frac{1}{\sqrt{1-t^2}}\,dt\right)^2$$

We note that, from the sum of the first nine numbers excluding 0, i.e., 1+2+3+4+5+6+7+8+9 = 45 (these are the fundamental numbers, from which, through infinite combinations, all the other numbers are obtained), we obtain the following interesting formula:

1+1/(((φ^2+(2Pi)/3*MRB const)(1/e((1+2+3+4+5+6+7+8+9)^(1/Pi))))^1/3)

Input

$$1+\frac{1}{\sqrt[3]{\left(\phi^2+\frac{2\pi}{3}C_{\text{MRB}}\right)\left(\frac{1}{e}\sqrt[\pi]{1+2+3+4+5+6+7+8+9}\right)}}$$

ϕ is the golden ratio

C_{MRB} is the MRB constant

Exact result

$$3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\phi^2}}+1$$

Decimal approximation

1.645297378520776032771896229793728200454953421110291570825393928 6

…

1.64529737852…. ≈ ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

Alternate forms

$$3^{1/3-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{2\pi C_{\text{MRB}} + 3\phi^2}} + 1$$

$$3^{-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3} + \frac{1}{2}\left(3+\sqrt{5}\right)}} + 1$$

$$2^{2/3} \times 3^{1/3-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{8\pi C_{\text{MRB}} + 18 + 6\sqrt{5}}} + 1$$

Expanded forms

$$3^{-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3} + \frac{1}{4}\left(1+\sqrt{5}\right)^2}} + 1$$

$$3^{-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3} + \frac{3}{2} + \frac{\sqrt{5}}{2}}} + 1$$

And:

sqrt(6(1+1/(((φ^2+(2Pi)/3*MRB const)(1/e((1+2+3+4+5+6+7+8+9)^(1/Pi))))^1/3)))

Input

$$\sqrt{6\left(1 + \frac{1}{\sqrt[3]{\left(\phi^2 + \frac{2\pi}{3} C_{\text{MRB}}\right)\left(\frac{1}{e}\sqrt[\pi]{1+2+3+4+5+6+7+8+9}\right)}}\right)}$$

ϕ is the golden ratio

C_{MRB} is the MRB constant

Exact result

$$\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\phi^2}}+1\right)}$$

Decimal approximation

3.14193957152658430892433073219616263267751338681165904468254173 93

…

3.141939571526…. ≈ π (Ramanujan Recurring Number)

Alternate forms

$$\sqrt{6\left(3^{1/3-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{2\pi C_{\text{MRB}}+3\phi^2}}+1\right)}$$

$$3^{1/2-1/(3\pi)}\times 5^{-1/(6\pi)}\sqrt{2\left(\sqrt[3]{\frac{6e}{4\pi C_{\text{MRB}}+9+3\sqrt{5}}}+3^{2/(3\pi)}\sqrt[3\pi]{5}\right)}$$

Expanded forms

$$\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\frac{1}{4}\left(1+\sqrt{5}\right)^2}}+1\right)}$$

$$\sqrt{2\times 3^{1-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{MRB}}{3}+\frac{3}{2}+\frac{\sqrt{5}}{2}}}+6}$$

All 2nd roots of 6 ($3^{-2/(3\pi)}\,5^{-1/(3\pi)}\,(e/((2\pi\,C_{MRB})/3+\phi^2))^{1/3}+1$)

$$e^{0}\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{MRB}}{3}+\phi^2}}+1\right)}\approx 3.1419 \text{ (real, principal root)}$$

$$e^{i\pi}\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{MRB}}{3}+\phi^2}}+1\right)}\approx -3.1419 \text{ (real root)}$$

Furthermore, we obtain also:

2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3))

Input

$$2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}$$

Exact result

8

8

value that is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 8 "modes" corresponding to the physical vibrations of a superstring.

Series representations

$$\frac{(2\pi\sqrt{2})(\sqrt{2}\,l^3)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 4\sqrt{z_0}^2\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2$$

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

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

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

$$\frac{(2\pi\sqrt{2})(\sqrt{2}\,l^3)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} =$$
$$4\left(\frac{1}{z_0}\right)^{\lfloor\arg(2-z_0)/(2\pi)\rfloor}z_0^{1+\lfloor\arg(2-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

$6\pi*\sqrt{2}((1/3*\sqrt{2}*l^3)/(4/3*\pi*(l/2)^3))$

Input

$$6\pi\sqrt{2} \times \frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}$$

Exact result

24

24

The value 24 is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string representing a bosons. From the analysis, we observe that the is no number theoretic connection with physical vibrations of fermionic strings at extremally low entropy. This fact is confirmed by the fact that the Higgs bosons at the moment of the big bang and infinitesimally shortly thereafter, facilitated the creation of fermions (matter and antimatter particles) [8]. Thus we note that the ingredients for the formation of electromagnetic radiation from photons (a Boson), and the formation of matter from the Higgs boson after the big bang, are intrinsic properties of the vacuum energy in pre-big bang.

Series representations

$$\frac{\left(6\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 12\sqrt{z_0}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2$$

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

$$\frac{\left(6\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 12\exp^2\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2$$

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

$$\frac{\left(6\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} =$$
$$12\left(\frac{1}{z_0}\right)^{\lfloor\arg(2-z_0)/(2\pi)\rfloor}z_0^{1+\lfloor\arg(2-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

This could imply that all matter (fermions) was preceded by bosons. That is, before the Big Bang, from perturbations of the vacuum energy itself, bosons were created, and successively at the Big Bang, and infinitesimally shortly after the Big Bang, fermions, were created from the vacuum energy that underwent a violent “breaking” that formed a hot plasma. of particle-antiparticle pairs. This therefore implies that quantum gravity was not necessarily “dark” to some extent, because a photon (light particle) is itself a boson. Therefore, a big bang was not necessarily the moment of the creation of light, but of the creation of matter (fermions) from vacuum energy, as this undergoes further "breaking" in the cosmological constant, in the hot plasma of matter and in the energy dark.

(2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4

Input

$$\left(2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}\right)^4$$

Exact result

4096

$4096 = 64^2$, (Ramanujan Recurring Number) that multiplied by 2 give 8192, indeed:

The total amplitude vanishes for gauge group SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, $SO(2^{13})$ i.e. SO(8192). (From: "Dilaton Tadpole for the Open Bosonic String " Michael R. Douglas and Benjamin Grinstein - September 2,1986)

27*sqrt((2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4)+1

Input

$$27\sqrt{\left(2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}\right)^4}+1$$

Exact result

1729

1729

This result is very near to the mass of candidate glueball $f_0(1710)$ scalar meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve ($1728 = 8^2 * 3^3$). The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number, as it can be expressed as the sum of two cubes in two different ways ($10^3 + 9^3 = 12^3 + 1^3 = 1729$) and Ramanujan's recurring number)

Series representations

$$27\sqrt{\left(\frac{\left(2\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3}\right)^4}+1=$$

$$1+27\sqrt{-1+256\sqrt{2}^{\,8}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1+256\sqrt{2}^{\,8}\right)^{-k}$$

$$27\sqrt{\left(\frac{\left(2\pi\sqrt{2}\right)\left(\sqrt{2}\ l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3}\right)^4}+1=$$

$$1+27\sqrt{-1+256\sqrt{2}^{\,8}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1+256\sqrt{2}^{\,8}\right)^{-k}}{k!}$$

$$27\sqrt{\left(\frac{\left(2\pi\sqrt{2}\right)\left(\sqrt{2}\ l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3}\right)^4}+1=1+27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(256\sqrt{2}^{\,8}-z_0\right)^k z_0^{-k}}{k!}$$

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

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

We note that:

1/25*1/144(((2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4)+(27*sqrt((2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4)+1))

Input

$$\frac{1}{25}\times\frac{1}{144}\left(\left(2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\ l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}\right)^4+\left(27\sqrt{\left(2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\ l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}\right)^4}+1\right)\right)$$

Exact result

$$\frac{233}{144}$$

Decimal approximation

1.6180555555555555555555555555555555555555555555555555555555555555555555555555

…

1.61805555…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

Repeating decimal

1.61805 (period 1)

Series representations

$$\frac{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+\left(27\sqrt{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+1}\right)}{144\times 25}=$$

$$\frac{1}{3600}\left(1+256\sqrt{z_0}^{\,8}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^8+27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(256\sqrt{2}^{\,8}-z_0\right)^k z_0^{-k}}{k!}\right)$$

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

$$\frac{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+\left(27\sqrt{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+1}\right)}{144\times 25}=$$

$$\frac{1}{3600}\left(1+256\exp^8\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,8}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^8+27\exp\left(i\pi\left\lfloor\frac{\arg\left(-x+256\sqrt{2}^{\,8}\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k x^{-k}\left(-\frac{1}{2}\right)_k\left(-x+256\sqrt{2}^{\,8}\right)^k}{k!}\right)$$

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

$$\frac{\left(\frac{2(\sqrt{2}\ l^3)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+\left(27\sqrt{\left(\frac{2(\sqrt{2}\ l^3)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+1}\right)}{144\times 25}=\frac{1}{3600}$$

$$\left(1+256\left(\frac{1}{z_0}\right)^{4\lfloor \arg(2-z_0)/(2\pi)\rfloor}z_0^{4+4\lfloor \arg(2-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^8+27\left(\frac{1}{z_0}\right)^{1/2\left\lfloor \arg\left(256\sqrt{2}^{\,8}-z_0\right)/(2\pi)\right\rfloor}z_0^{1/2+1/2\left\lfloor \arg\left(256\sqrt{2}^{\,8}-z_0\right)/(2\pi)\right\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(256\sqrt{2}^{\,8}-z_0\right)^k z_0^{-k}}{k!}\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

From

$\frac{2\sqrt{2}}{\pi}$ is a transcendental number

we obtain also:

sqrt(6(1/3*(2/(((2sqrt2)/Pi)))^2))

Input

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

Exact result

π

Decimal approximation

3.14159265358979323846264338327950288419716939937510582097494459 23

…

3.14159265358… = π

Property

π is a transcendental number

All 2nd roots of π^2

$\pi e^0 \approx 3.1416$ (real, principal root)

$\pi e^{i\pi} \approx -3.1416$ (real root)

Series representations

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 4\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = \sum_{k=0}^{\infty} -\frac{4(-1)^k\, 1195^{-1-2k}\left(5^{1+2k} - 4\times 239^{1+2k}\right)}{1+2k}$$

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = \sum_{k=0}^{\infty}\left(-\frac{1}{4}\right)^k\left(\frac{1}{1+2k}+\frac{2}{1+4k}+\frac{1}{3+4k}\right)$$

Integral representations

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 4\int_0^1 \sqrt{1-t^2}\,dt$$

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 2\int_0^1 \frac{1}{\sqrt{1-t^2}}\,dt$$

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 2\int_0^\infty \frac{1}{1+t^2}\,dt$$

It is plausible to hypothesize that π and φ, in addition to being important mathematical constants, are constants that also have a fundamental relevance in the various sectors of Theoretical Physics and Cosmology

From $\frac{\pi^2}{6}$, we obtain:

sqrt(1/(Pi^2/6)*(4/3))

Input

$$\sqrt{\frac{1}{\frac{\pi^2}{6}} \times \frac{4}{3}}$$

Exact result

$$\frac{2\sqrt{2}}{\pi}$$

Decimal approximation

0.900316316157106069555199191006740582664574149955220625571437471 2…

0.900316316157106…. = $\frac{2\sqrt{2}}{\pi}$ (DN Constant)

Property

$\frac{2\sqrt{2}}{\pi}$ is a transcendental number

All 2nd roots of $8/\pi^2$

$$\frac{2\sqrt{2}\ e^0}{\pi} \approx 0.9003 \quad \text{(real, principal root)}$$

$$\frac{2\sqrt{2}\ e^{i\pi}}{\pi} \approx -0.9003 \quad \text{(real root)}$$

Series representations

$$\sqrt{\frac{4}{\frac{3\pi^2}{6}}} = \sum_{k=0}^{\infty} \frac{(-1)^k \left(-1+\frac{8}{\pi^2}\right)^k \left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{\frac{4}{\frac{3\pi^2}{6}}} = \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{8}{\pi^2}-z_0\right)^k z_0^{-k}}{k!} \quad \text{for } (\text{not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$$

$$\sqrt{\frac{4}{\frac{3\pi^2}{6}}} = \exp\left(i\pi \left\lfloor \frac{\arg\left(\frac{8}{\pi^2}-x\right)}{2\pi} \right\rfloor\right) \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k \left(\frac{8}{\pi^2}-x\right)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}$$

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

$n!$ is the factorial function

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

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i is the imaginary unit

DN Constant extended

We have the following expression concerning the ratios (and/or the inverses) between the icosahedron, octahedron and tetrahedron volumes and the sphere volume.

$$\sqrt[2\pi]{\frac{\frac{5}{12}(3+\sqrt{5})d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}\times\frac{1}{\frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}}\times\frac{1}{\frac{\sqrt{2}}{12}d^3\cdot\frac{1}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}}$$

(we have highlighted the DN Constant in blue)

(((((5/12*(3+√5)*d^3)/(4/3*π*(d/2)^3))*1/((1/3*√2*a^3)/(4/3*π*(a/2)^3)) *1/((((√2 d^3)/12))*1/(4/3*π*(d/2)^3)))))^(1/(2π))

Input

$$\sqrt[2\pi]{\frac{\frac{5}{12}\left(3+\sqrt{5}\right)d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}\times\frac{1}{\frac{\frac{1}{3}\sqrt{2}\,a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}}\times\frac{1}{\left(\frac{1}{12}\left(\sqrt{2}\,d^3\right)\right)\times\frac{1}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}}$$

Exact result

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

Decimal approximation

1.618008545900107058100262397953600521294343596022695608492128897 1

…

1.6180085459…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

Alternate form

$$2^{-1/\pi}\sqrt[2\pi]{\left(15+5\sqrt{5}\right)\pi}$$

Series representations

$$\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)^3}}}=\sqrt[2\pi]{\frac{5}{2}}\sqrt[2\pi]{\frac{\pi\left(3+\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)}{\sqrt{z_0}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2}}$$

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

$$\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)^3}}}=$$

$$\sqrt[2\pi]{\frac{5}{2}}\sqrt[2\pi]{\frac{\pi\left(3+\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}{\exp^2\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2}}$$

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

$$\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)^3}}}=$$

$$\sqrt[2\pi]{\frac{5}{2}}\left(\left(\left(\pi\left(\frac{1}{z_0}\right)^{-\lfloor\arg(2-z_0)/(2\pi)\rfloor}z_0^{-1-\lfloor\arg(2-z_0)/(2\pi)\rfloor}\left(3+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)\right)\Big/\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2\right)^{\wedge}\left(\frac{1}{2\pi}\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

Integral representation

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

$\Gamma(x)$ is the gamma function

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

$|z|$ is the absolute value of z

Furthermore, from the formula

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

we obtain also:

(4 (1.6180085459)^(2 π))/(5 (3 + sqrt(5))) = 3.1415926535

Indeed:

$$\frac{4\times 1.6180085459^{2\pi}}{5\left(3+\sqrt{5}\right)}$$

3.14159265358848716242219325098587152789310251892455761700781006 13

…

3.1415926535…. = π (Ramanujan Recurring Number)

From the following extended DN Constant (“Unitary Formula”)

$$\sqrt[2\pi]{\frac{\frac{5}{12}(3+\sqrt{5})d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}\times\frac{1}{\frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}}\times\frac{1}{\frac{\sqrt{2}}{12}d^3\cdot\frac{1}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}}\times\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}$$

with regard

$$\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}$$

for q = 1729 and p = 4096, we obtain by changing the sign in the algebraic sum of the aforementioned Cardano’s Formula and after some calculations:

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

multiplied by

$$\sqrt[9]{\sqrt[3]{-\frac{1729}{2}+\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}-\sqrt[3]{-\frac{1729}{2}-\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}}$$

and performing the ninth root of the entire expression:

√((2^(-1/π)(5(3+√(5))π)^(1/(2π)))((∛(-1729/2+√(1729^2/4+4096^3/27)) -∛(-1729/2-√(1729^2/4+4096^3/27)))^1/9))

we obtain:

$$\sqrt{\left(\left(2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\right)\sqrt[9]{\sqrt[3]{-\frac{1729}{2}+\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}-\sqrt[3]{-\frac{1729}{2}-\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}}\right)}$$

$$2^{-1/(2\pi)}\sqrt[18]{\sqrt[3]{\frac{\sqrt{\frac{274\,958\,621\,851}{3}}}{6}-\frac{1729}{2}}+\sqrt[3]{\frac{1729}{2}+\frac{\sqrt{\frac{274\,958\,621\,851}{3}}}{6}}}\Big/\sqrt[4\pi]{5\left(3+\sqrt{5}\right)\pi}$$

i.e.

2^(-1/(2π)) ((-1729/2+√(274958621851/3)/6)^(1/3)+(1729/2 + √(274958621851/3)/6)^(1/3))^(1/18) (5(3+√(5)) π)^(1/(4π))

= 1.61549140391….

The general "unitary" formula, which derives from DN Constant, is the following:

$$\sqrt{2\times\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\cdot 0.9991104684}(C\times \mathrm{R}\times 2.33\cdot 10^{-13})}}\cong 1.61803398\ldots=\frac{\sqrt{5}+1}{2}$$

Where $\frac{2\sqrt{2}}{\pi}$ is the Del Gaudio-Nardelli Constant, 0.9991104684 is the value of the following Rogers-Ramanujan continued fraction:

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

C is any constant or solution to an equation, R is the radius of the Universe and $2.33*10^{-13}$ is the temperature of the universe expressed in GeV.

For example, $C = 9.9128$, inserting a radius of the Universe, which we have calculated, equal to $R = 2.06274*10^{12}$ years, from DN Constant "unitary" formula, we obtain:

√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13))))

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times 0.9991104684}\times\frac{9.9128\times 2.06274\times 10^{12}\times 2.33}{10^{13}}}}$$

1.618035912348264235440174408834709854254527350840173356306481810 7

…

1.618035912348…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

We obtain also:

(√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13)))))dxdydz

Indefinite integral assuming all variables are real

$$0.809018\, x^2\, y\, z + \text{constant}$$

Definite integral over a cube of edge length 2 L

$$\int_{-L}^{L}\int_{-L}^{L}\int_{-L}^{L} 1.61804\, dx\, dy\, dz = 12.9443\, L^3$$

Definite integral over a sphere of radius R

$$\iiint_{x^2+y^2+z^2<R^2} 1.61804\, dz\, dy\, dx = 6.77761\, R^3$$

From which, for L = R = 1 , dividing the two definite integral results by the original expression, we obtain:

12.9443/(√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13)))))

Input interpretation

$$\frac{12.9443}{\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times 0.9991104684}\times\frac{9.9128\times 2.06274\times 10^{12}\times 2.33}{10^{13}}}}}$$

Result

8.00001…

8.00001…. ≈ 8

value that is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 8 "modes" corresponding to the physical vibrations of a superstring.

And

3*(6.77761/(√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13))))))

Input interpretation

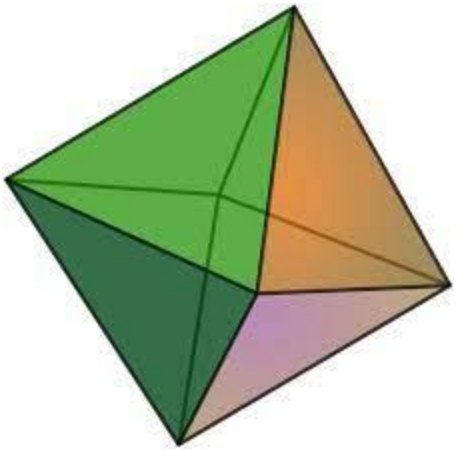
$$3\times\frac{6.77761}{\sqrt{2\times\frac{2^{16}\sqrt{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times 0.9991104684}\times\frac{9.9128\times 2.06274\times 10^{12}\times 2.33}{10^{13}}}}}$$

Result

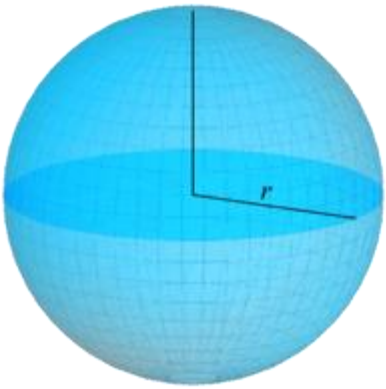
12.5664…

12.5664…. ≈ 4π = Bekenstein-Hawking (S_{BH}) black hole entropy

Now, we have that:



Octahedron



Sphere

Given the value of a volume, independently of the solid, following the Poincaré Conjecture, we compare any solid "without holes" and a sphere. If we compare an octahedron with a sphere, we have:

$$\frac{4}{3}\pi r^3 = \frac{1}{3}\sqrt{2}a^3$$

If we consider the radius of the sphere as an unknown, we must find the value of the side of the octahedron which allows us to equalize the two volumes and which will give us the DN Constant as a result (which will therefore be equal to the radius of the sphere).

From

$$\frac{4}{3}\pi r^3 = \frac{1}{3}\sqrt{2}a^3$$

To find r we perform the following calculation:

$$r^3 = \frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi} = \frac{1}{3}\sqrt{2}a^3 \cdot \frac{3}{4\pi} = \frac{\sqrt{2}a^3}{4\pi} = \frac{\sqrt{2}\cdot\sqrt{2}a^3}{\sqrt{2}\cdot 4\pi} = \frac{2a^3}{\sqrt{2}\cdot 4\pi} = \frac{a^3}{2\sqrt{2}\pi}$$

$$r^3 = \frac{a^3}{2\sqrt{2}\pi}; \qquad r = \sqrt[3]{\frac{a^3}{2\sqrt{2}\pi}} = \frac{a}{\sqrt[3]{2\sqrt{2}\pi}}$$

To find *a*, we have, for

$$r = \frac{2\sqrt{2}}{\pi}; \qquad \frac{a}{\sqrt[3]{2\sqrt{2}\pi}} = \frac{2\sqrt{2}}{\pi};$$

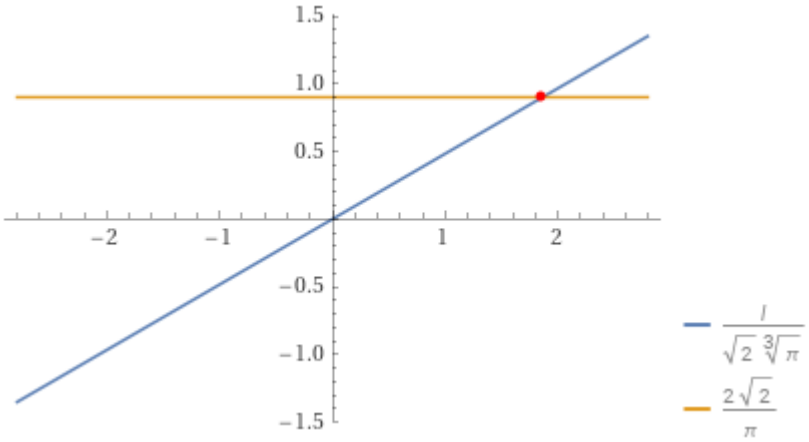
Thus, multiplying both the sides by $\sqrt[3]{2\sqrt{2}\pi}$, we obtain:

$$a = \frac{2\sqrt{2}}{\pi} \cdot \sqrt[3]{2\sqrt{2}\pi} = \sqrt[3]{\frac{(2\sqrt{2})^3 2\sqrt{2}\pi}{\pi^3}} =$$

$$= \sqrt[3]{\frac{8 \cdot \sqrt{2^3} \cdot 2\sqrt{2}}{\pi^2}} = \sqrt[3]{\frac{8 \cdot \sqrt{2 \cdot 2^2} \cdot 2\sqrt{2}}{\pi^2}} = \sqrt[3]{\frac{16 \cdot \sqrt{2} \cdot 2\sqrt{2}}{\pi^2}}$$

$$= \sqrt[3]{\frac{32\sqrt{2}\sqrt{2}}{\pi^2}} = \sqrt[3]{\frac{32 \cdot 2}{\pi^2}} = \frac{\sqrt[3]{64}}{\sqrt[3]{\pi^2}} = \frac{4}{\sqrt[3]{\pi^2}}; \; a = \frac{4}{\sqrt[3]{\pi^2}}$$

Plot



Solution

$a = \frac{4}{\sqrt[3]{\pi^2}}$

for V = 1/3*√2*a^3 (octahedron volume) and V = (4/3*π*r^3) (sphere volume), we obtain:

from the octahedron volume, we have: V = 1/3*√2*a^3 = (1/3*√2*($\frac{4}{\sqrt[3]{\pi^2}}$)^3)

(1/3*√2*(4/∛(π^2))^3)

Input

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3$$

$\sqrt[3]{x}$ is the real-valued 3rd root of x

Exact result

$$\frac{64\sqrt{2}}{3\pi^2}$$

Decimal approximation

3.056848897337366735284768744174643472880661991020386025343029413 7

…

3.05684889733….

Property

$\frac{64\sqrt{2}}{3\pi^2}$ is a transcendental number

Series representations

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3 = \frac{64\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}{3\pi^2}$$

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

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3 = \frac{64\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{3\pi^2}$$

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

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3 = \frac{64\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(2-z_0)/(2\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}{3\pi^2}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

And, from the sphere volume V = (4/3*π*r^3) = (4/3*π*((2√2)/π)^3)

(4/3*π*((2√2)/π)^3)

Input

$$\frac{4}{3}\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3$$

Result

$$\frac{64\sqrt{2}}{3\pi^2}$$

Decimal approximation

3.056848897337366735284768744174643472880661991020386025343029413 7

…

3.05684889733….

Property

$\frac{64\sqrt{2}}{3\pi^2}$ is a transcendental number

Series representations

$$\frac{1}{3}\left(\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3\right)4 = \frac{32\sqrt{z_0}^3\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^3}{3\pi^2}$$

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

$$\frac{1}{3}\left(\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3\right)4 = \frac{32\exp^3\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,3}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^3}{3\pi^2}$$

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

$$\frac{1}{3}\left(\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3\right)4 = \frac{32\left(\frac{1}{z_0}\right)^{3/2\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{3/2(1+\lfloor\arg(2-z_0)/(2\pi)\rfloor)}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^3}{3\pi^2}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

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

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

i is the imaginary unit

From:

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

We have that:

Hence

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

so that

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

Hence

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

Again

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

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

so that

$$64(G_{37}^{24} + G_{37}^{-24}) = e^{\pi\sqrt{37}} + 24 + 4372e^{-\pi\sqrt{37}} - \cdots = 64\{(6+\sqrt{37})^{6} + (6-\sqrt{37})^{6}\}.$$

Hence

$$e^{\pi\sqrt{37}} = 199148647.999978\ldots.$$

Similarly, from

$$g_{58} = \sqrt{\left(\frac{5+\sqrt{29}}{2}\right)},$$

we obtain

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

Hence

$$e^{\pi\sqrt{58}} = 24591257751.99999982\ldots.$$

We note that, with regard 4372, we can to obtain the following results:

27((4372)^1/2-2-1/2(((√(10-2√5) -2))/((√5-1))))+φ

Input

$$27\left(\sqrt{4372}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi$$

ϕ is the golden ratio

Result

$$\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)$$

Decimal approximation

1729.052694417090562517063720863714876368418930653845785481544702 3

…

1729.0526944….

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. ($1728 = 8^2 * 3^3$) The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

Alternate forms

$$\frac{1}{8}\left(-27\sqrt{5\left(10-2\sqrt{5}\right)}+58\sqrt{5}+432\sqrt{1093}-27\sqrt{2\left(5-\sqrt{5}\right)}-374\right)$$

$$\phi-54+54\sqrt{1093}+\frac{27}{4}\left(1+\sqrt{5}-\sqrt{2\left(5+\sqrt{5}\right)}\right)$$

$$\phi - 54 + 54\sqrt{1093} - \frac{27\left(\sqrt{10-2\sqrt{5}}-2\right)}{2\left(\sqrt{5}-1\right)}$$

Minimal polynomial

$$256\,x^8 + 95\,744\,x^7 - 3\,248\,750\,080\,x^6 - 914\,210\,725\,504\,x^5 + 15\,498\,355\,554\,921\,184\,x^4 + 2\,911\,478\,392\,539\,914\,656\,x^3 - 32\,941\,144\,911\,224\,677\,091\,680\,x^2 - 3\,092\,528\,914\,069\,760\,354\,714\,456\,x + 26\,320\,050\,609\,744\,039\,027\,169\,013\,041$$

Expanded forms

$$-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10-2\sqrt{5}} - \frac{27}{8}\sqrt{5\left(10-2\sqrt{5}\right)}$$

$$-\frac{107}{2} + \frac{\sqrt{5}}{2} + 54\sqrt{1093} + \frac{27}{\sqrt{5}-1} - \frac{27\sqrt{10-2\sqrt{5}}}{2\left(\sqrt{5}-1\right)}$$

Series representations

$$27\left(\sqrt{4372} - 2 - \frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right) + \phi = \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 2\phi\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} - 27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(9-2\sqrt{5}\right)^{-k}\right) \Big/ \left(2\left(-1+\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k}\right)\right)$$

$$27\left(\sqrt{4372}\ -2-\frac{\sqrt{10-2\sqrt{5}}\ -2}{\left(\sqrt{5}\ -1\right)2}\right)+\phi=$$
$$\left(162-108\sqrt{1093}\ -2\phi-108\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+\right.$$
$$108\sqrt{1093}\ \sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+2\phi\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}-$$
$$\left.27\sqrt{9-2\sqrt{5}}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(9-2\sqrt{5}\right)^{-k}}{k!}\right)\Big/$$
$$\left(2\left(-1+\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)$$

$$27\left(\sqrt{4372}\ -2-\frac{\sqrt{10-2\sqrt{5}}\ -2}{\left(\sqrt{5}\ -1\right)2}\right)+\phi=$$
$$\left(162-108\sqrt{1093}\ -2\phi-108\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}+\right.$$
$$108\sqrt{1093}\ \sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}+$$
$$2\phi\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}-$$
$$\left.27\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(10-2\sqrt{5}\ -z_0\right)^k\,z_0^{-k}}{k!}\right)\Big/$$
$$\left(2\left(-1+\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)\right)$$
for $(\text{not } (z_0\in\mathbb{R} \text{ and } -\infty < z_0 \le 0))$

Or:

27((4096+276)^1/2-2-1/2(((√(10-2√5) -2))/((√5-1))))+φ

Input

$$27\left(\sqrt{4096+276}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi$$

ϕ is the golden ratio

Result

$$\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)$$

Decimal approximation

1729.052694417090562517063720863714876368418930653845785481544702 3…

1729.0526944…. as above

Alternate forms

$$\frac{1}{8}\left(-27\sqrt{5\left(10-2\sqrt{5}\right)}+58\sqrt{5}+432\sqrt{1093}-27\sqrt{2\left(5-\sqrt{5}\right)}-374\right)$$

$$\phi-54+54\sqrt{1093}+\frac{27}{4}\left(1+\sqrt{5}-\sqrt{2\left(5+\sqrt{5}\right)}\right)$$

$$\phi-54+54\sqrt{1093}-\frac{27\left(\sqrt{10-2\sqrt{5}}-2\right)}{2\left(\sqrt{5}-1\right)}$$

Minimal polynomial

$$256\,x^8 + 95\,744\,x^7 - 3\,248\,750\,080\,x^6 - 914\,210\,725\,504\,x^5 + 15\,498\,355\,554\,921\,184\,x^4 + 2\,911\,478\,392\,539\,914\,656\,x^3 - 32\,941\,144\,911\,224\,677\,091\,680\,x^2 - 3\,092\,528\,914\,069\,760\,354\,714\,456\,x + 26\,320\,050\,609\,744\,039\,027\,169\,013\,041$$

Expanded forms

$$-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10 - 2\sqrt{5}} - \frac{27}{8}\sqrt{5\left(10 - 2\sqrt{5}\right)}$$

$$-\frac{107}{2} + \frac{\sqrt{5}}{2} + 54\sqrt{1093} + \frac{27}{\sqrt{5} - 1} - \frac{27\sqrt{10 - 2\sqrt{5}}}{2\left(\sqrt{5} - 1\right)}$$

Series representations

$$27\left(\sqrt{4096 + 276} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{\left(\sqrt{5} - 1\right)2}\right) + \phi = \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 2\phi\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} - 27\sqrt{9 - 2\sqrt{5}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(9 - 2\sqrt{5}\right)^{-k}\right) \Big/ \left(2\left(-1 + \sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k}\right)\right)$$

$$27\left(\sqrt{4096+276}\ -2-\frac{\sqrt{10-2\sqrt{5}}\ -2}{\left(\sqrt{5}\ -1\right)2}\right)+\phi=$$
$$\left(162-108\sqrt{1093}\ -2\phi-108\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+\right.$$
$$108\sqrt{1093}\ \sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+2\phi\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}-$$
$$\left.27\sqrt{9-2\sqrt{5}}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(9-2\sqrt{5}\right)^{-k}}{k!}\right)\Big/$$
$$\left(2\left(-1+\sqrt{4}\ \sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)$$

$$27\left(\sqrt{4096+276}\ -2-\frac{\sqrt{10-2\sqrt{5}}\ -2}{\left(\sqrt{5}\ -1\right)2}\right)+\phi=$$
$$\left(162-108\sqrt{1093}\ -2\phi-108\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}+\right.$$
$$108\sqrt{1093}\ \sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}+$$
$$2\phi\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}-$$
$$\left.27\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(10-2\sqrt{5}\ -z_0\right)^k\,z_0^{-k}}{k!}\right)\Big/$$
$$\left(2\left(-1+\sqrt{z_0}\ \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)\right)$$
for $(\text{not}\ (z_0\in\mathbb{R}\ \text{and}\ -\infty<z_0\le 0))$

From which:

(27((4372)^1/2-2-1/2(((√(10-2√5) -2))/((√5-1))))+φ)^1/15

Input

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi}$$

ϕ is the golden ratio

Exact result

$$\sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)}$$

Decimal approximation

1.643818568584986279990230131703681005418575687350518480483418312 4

…

$1.64381856858\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

Alternate forms

$$\sqrt[15]{\phi-54+54\sqrt{1093}-\frac{27\left(\sqrt{10-2\sqrt{5}}-2\right)}{2\left(\sqrt{5}-1\right)}}$$

$$\frac{1}{\sqrt[15]{\frac{2\left(\sqrt{5}-1\right)}{166-108\sqrt{5}-108\sqrt{1093}+108\sqrt{5465}-27\sqrt{2\left(5-\sqrt{5}\right)}}}}$$

$$\sqrt[15]{\text{root of } 256\,x^8 + 95\,744\,x^7 - 3\,248\,750\,080\,x^6 - 914\,210\,725\,504\,x^5 + 15\,498\,355\,554\,921\,184\,x^4 + 2\,911\,478\,392\,539\,914\,656\,x^3 - 32\,941\,144\,911\,224\,677\,091\,680\,x^2 - 3\,092\,528\,914\,069\,760\,354\,714\,456\,x + 26\,320\,050\,609\,744\,039\,027\,169\,013\,041 \text{ near } x = 1729.05}$$

Minimal polynomial

$$256\,x^{120} + 95\,744\,x^{105} - 3\,248\,750\,080\,x^{90} - 914\,210\,725\,504\,x^{75} + 15\,498\,355\,554\,921\,184\,x^{60} + 2\,911\,478\,392\,539\,914\,656\,x^{45} - 32\,941\,144\,911\,224\,677\,091\,680\,x^{30} - 3\,092\,528\,914\,069\,760\,354\,714\,456\,x^{15} + 26\,320\,050\,609\,744\,039\,027\,169\,013\,041$$

Expanded forms

$$\sqrt[15]{\frac{1}{2}\left(1+\sqrt{5}\right) + 27\left(-2 + 2\sqrt{1093} - \frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)}$$

$$\sqrt[15]{-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10-2\sqrt{5}} - \frac{27}{8}\sqrt{5\left(10-2\sqrt{5}\right)}}$$

All 15th roots of ϕ + 27 (-2 + 2 sqrt(1093) - (sqrt(10 - 2 sqrt(5)) - 2)/(2 (sqrt(5) - 1)))

$$e^0\sqrt[15]{\phi + 27\left(-2 + 2\sqrt{1093} - \frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)} \approx 1.64382 \text{ (real, principal root)}$$

$$e^{(2i\pi)/15}\sqrt[15]{\phi + 27\left(-2 + 2\sqrt{1093} - \frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)} \approx 1.50170 + 0.6686\,i$$

$$e^{(4\,i\,\pi)/15}\sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)}\approx 1.0999+1.2216\,i$$

$$e^{(2\,i\,\pi)/5}\sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)}\approx 0.5080+1.5634\,i$$

$$e^{(8\,i\,\pi)/15}\sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)}\approx -0.17183+1.63481\,i$$

Series representations

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi}=$$
$$\frac{1}{\sqrt[15]{2}}\left(\left(\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}+108\sqrt{1093}\sqrt{4}\right.\right.\right.$$
$$\left.\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}+2\phi\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}-27\sqrt{9-2\sqrt{5}}\right.$$
$$\left.\left.\left.\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(9-2\sqrt{5}\right)^{-k}\right)\Big/\left(-1+\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}\right)\right)\right)\wedge(1/15)\Bigg)$$

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi}=$$
$$\frac{1}{\sqrt[15]{2}}\left(\left(\left(\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+\right.\right.\right.\right.$$
$$\left.\left.\left.\left.108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+2\phi\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}-\right.\right.\right.\right.$$
$$\left.\left.\left.\left.27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(9-2\sqrt{5}\right)^{-k}}{k!}\right)\right/\right.\right.$$
$$\left.\left.\left(-1+\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)\wedge(1/15)\right)$$

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi}=$$
$$\frac{1}{\sqrt[15]{2}}\left(\left(\left(\left(162-108\sqrt{1093}-2\phi-108\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+\right.\right.\right.\right.$$
$$\left.\left.\left.\left.108\sqrt{1093}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+\right.\right.\right.\right.$$
$$\left.\left.\left.\left.2\phi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}-\right.\right.\right.\right.$$
$$\left.\left.\left.\left.27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(10-2\sqrt{5}-z_0\right)^k z_0^{-k}}{k!}\right)\right/\right.\right.$$
$$\left.\left.\left(-1+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)\right)\wedge(1/15)\right)$$
for $(\text{not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$

Integral representation

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

From:

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

From the following vacuum equations:

$$T\, e^{\gamma_E \phi} = -\frac{\beta_E^{(p)}\, h^2}{\gamma_E}\, e^{-2(8-p)C + 2\beta_E^{(p)}\phi}$$

$$16\, k'\, e^{-2C} = \frac{h^2 \left(p + 1 - \frac{2\beta_E^{(p)}}{\gamma_E}\right) e^{-2(8-p)C + 2\beta_E^{(p)}\phi}}{(7-p)}$$

$$(A')^2 = k\, e^{-2A} + \frac{h^2}{16(p+1)} \left(7 - p + \frac{2\beta_E^{(p)}}{\gamma_E}\right) e^{-2(8-p)C + 2\beta_E^{(p)}\phi}$$

we have obtained, from the results almost equals of the equations, putting

$4096\, e^{-\pi\sqrt{18}}$ instead of

$$e^{-2(8-p)C + 2\beta_E^{(p)}\phi}$$

a new possible mathematical connection between the two exponentials. Thence, also the values concerning *p*, *C*, β_E and ϕ correspond to the exponents of *e* (i.e. of exp). Thence we obtain for p = 5 and β_E = 1/2:

$$e^{-6C+\phi} = 4096 e^{-\pi\sqrt{18}}$$

Therefore, with respect to the exponentials of the vacuum equations, the Ramanujan's exponential has a coefficient of 4096 which is equal to 64^2, while -6C+ϕ is equal to -$\pi\sqrt{18}$. From this it follows that it is possible to establish mathematically, the dilaton value.

For

exp((-Pi*sqrt(18)) we obtain:

Input:

$$\exp\left(-\pi\sqrt{18}\right)$$

Exact result:

$$e^{-3\sqrt{2}\,\pi}$$

Decimal approximation:

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

1.6272016… * 10^{-6}

Property:

$e^{-3\sqrt{2}\,\pi}$ is a transcendental number

Series representations:

$$e^{-\pi\sqrt{18}} = e^{-\pi\sqrt{17}\,\sum_{k=0}^{\infty} 17^{-k}\binom{1/2}{k}}$$

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

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

Now, we have the following calculations:

$$e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$$

$$e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

from which:

$$\frac{1}{4096}e^{-6C+\phi} = 1.6272016\ldots * 10^{-6}$$

$$0.000244140625\ e^{-6C+\phi} = e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

Now:

$$\ln\left(e^{-\pi\sqrt{18}}\right) = -13.328648814475 = -\pi\sqrt{18}$$

And:

(1.6272016* 10^-6) *1/ (0.000244140625)

Input interpretation:

$$\frac{1.6272016}{10^6} \times \frac{1}{0.000244140625}$$

Result:

0.0066650177536

0.006665017...

Thence:

$$0.000244140625\, e^{-6C+\phi} = e^{-\pi\sqrt{18}}$$

Dividing both sides by 0.000244140625, we obtain:

$$\frac{0.000244140625}{0.000244140625} e^{-6C+\phi} = \frac{1}{0.000244140625} e^{-\pi\sqrt{18}}$$

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

((((exp((-Pi*sqrt(18)))))))*1/0.000244140625

Input interpretation:

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

Result:

0.00666501785...

0.00666501785…

Series representations:

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

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

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

Now:

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

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

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

$$= 0.00666501785\ldots$$

From:

ln(0.00666501784619)

Input interpretation:

$\log(0.00666501784619)$

Result:

–5.010882647757…

-5.010882647757…

Alternative representations:

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

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

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

Series representations:

$$\log(0.006665017846190000) = -\sum_{k=1}^{\infty} \frac{(-1)^k\,(-0.993334982153810000)^k}{k}$$

$$\log(0.006665017846190000) = 2\,i\,\pi\left\lfloor \frac{\arg(0.006665017846190000 - x)}{2\,\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k\,(0.006665017846190000 - x)^k\,x^{-k}}{k} \quad \text{for } x < 0$$

$$\log(0.006665017846190000) = \left\lfloor \frac{\arg(0.006665017846190000 - z_0)}{2\pi} \right\rfloor \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left\lfloor \frac{\arg(0.006665017846190000 - z_0)}{2\pi} \right\rfloor \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k \, (0.006665017846190000 - z_0)^k \, z_0^{-k}}{k}$$

Integral representation:

$$\log(0.006665017846190000) = \int_1^{0.006665017846190000} \frac{1}{t}\, dt$$

In conclusion:

$$-6C + \phi = -5.010882647757\ldots$$

and for C = 1, we obtain:

$$\phi = -5.010882647757 + 6 = 0.989117352243 = \boldsymbol{\phi}$$

Note that the values of n_s (spectral index) 0.965, of the average of the Omega mesons Regge slope 0.987428571 and of the dilaton 0.989117352243, are also connected to the following two Rogers-Ramanujan continued fractions:

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

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

(http://www.bitman.name/math/article/102/109/)

Also performing the 512th root of the inverse value of the Pion meson rest mass 139.57, we obtain:

((1/(139.57)))^1/512

Input interpretation:

$$\sqrt[512]{\frac{1}{139.57}}$$

Result:

0.990400732708644027550973755713301415460732796178555551684...

0.99040073.... result very near to the dilaton value 0.989117352243 = $\boldsymbol{\phi}$ and to the value of the following Rogers-Ramanujan continued fraction:

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

From

Properties of Nilpotent Supergravity - *E. Dudas, S. Ferrara, A. Kehagias and A. Sagnotti* - arXiv:1507.07842v2 [hep-th] 14 Sep 2015

We have that:

Cosmological inflation with a tiny tensor–to–scalar ratio r, consistently with PLANCK data, may also be described within the present framework, for instance choosing

$$\alpha(\Phi) \;=\; i\,M\left(\Phi \;+\; b\,\Phi\,e^{ik\,\Phi}\right)\,. \tag{4.35}$$

This potential bears some similarities with the Kähler moduli inflation of [32] and with the poly–instanton inflation of [33]. One can verify that $\chi = 0$ solves the field equations, and that the potential along the $\chi = 0$ trajectory is now

$$V \;=\; \frac{M^2}{3}\left(1 \;-\; a\,\phi\,e^{-\gamma\,\phi}\right)^2\,. \tag{4.36}$$

We analyzing the following equation:

$$V \;=\; \frac{M^2}{3}\left(1 \;-\; a\,\phi\,e^{-\gamma\,\phi}\right)^2\,.$$

$$\phi \;=\; \varphi \;-\; \frac{\sqrt{6}}{k}\,,$$

$$a \;=\; \frac{b\gamma}{e} \;<\; 0\,, \qquad \gamma \;=\; \frac{k}{\sqrt{6}} \;<\; 0\,.$$

We have:

(M^2)/3*[1-(b/euler number * k/sqrt6) * (φ- sqrt6/k) * exp(-(k/sqrt6)(φ- sqrt6/k))]^2

i.e.

V = (M^2)/3*[1-(b/euler number * k/sqrt6) * (φ- sqrt6/k) * exp(-(k/sqrt6)(φ- sqrt6/k))]^2

For k = 2 and φ = 0.9991104684, that is the value of the scalar field that is equal to the value of the following Rogers-Ramanujan continued fraction:

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

we obtain:

V = (M^2)/3*[1-(b/euler number * 2/sqrt6) * (0.9991104684- sqrt6/2) * exp(-(2/sqrt6)(0.9991104684- sqrt6/2))]^2

Input interpretation:

$$V=\frac{M^2}{3}\left(1-\left(\frac{b}{e}\times\frac{2}{\sqrt{6}}\right)\left(0.9991104684-\frac{\sqrt{6}}{2}\right)\exp\left(-\frac{2}{\sqrt{6}}\left(0.9991104684-\frac{\sqrt{6}}{2}\right)\right)\right)^2$$

Result:

$$V=\frac{1}{3}(0.0814845\,b+1)^2\,M^2$$

Solutions:

$$b = \frac{225.913\left(-0.054323\,M^2 \pm 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2} \quad (M \neq 0)$$

Alternate forms:

$$V = 0.00221324\,(b + 12.2723)^2\,M^2$$

$$V = 0.00221324\left(b^2\,M^2 + 24.5445\,b\,M^2 + 150.609\,M^2\right)$$

$$-0.00221324\,b^2\,M^2 - 0.054323\,b\,M^2 - \frac{M^2}{3} + V = 0$$

Expanded form:

$$V = 0.00221324\,b^2\,M^2 + 0.054323\,b\,M^2 + \frac{M^2}{3}$$

Alternate form assuming b, M, and V are positive:

$$V = 0.00221324\,(b + 12.2723)^2\,M^2$$

Alternate form assuming b, M, and V are real:

$$V = 0.00221324\,b^2\,M^2 + 0.054323\,b\,M^2 + 0.333333\,M^2 + 0$$

Derivative:

$$\frac{\partial}{\partial b}\left(\frac{1}{3}\,(0.0814845\,b + 1)^2\,M^2\right) = 0.054323\,(0.0814845\,b + 1)\,M^2$$

Implicit derivatives

$$\frac{\partial b(M,V)}{\partial V} = \frac{154\,317\,775\,011\,120\,075}{36\,961\,748\,(226\,802\,245 + 18\,480\,874\,b)\,M^2}$$

$$\frac{\partial b(M,V)}{\partial M} = -\frac{\frac{226\,802\,245}{18\,480\,874} + b}{M}$$

$$\frac{\partial M(b,V)}{\partial V} = \frac{154\,317\,775\,011\,120\,075}{2\,(226\,802\,245 + 18\,480\,874\,b)^2\,M}$$

$$\frac{\partial M(b,V)}{\partial b} = -\frac{18\,480\,874\,M}{226\,802\,245 + 18\,480\,874\,b}$$

$$\frac{\partial V(b,M)}{\partial M} = \frac{2\,(226\,802\,245 + 18\,480\,874\,b)^2\,M}{154\,317\,775\,011\,120\,075}$$

$$\frac{\partial V(b,M)}{\partial b} = \frac{36\,961\,748\,(226\,802\,245 + 18\,480\,874\,b)\,M^2}{154\,317\,775\,011\,120\,075}$$

Global minimum:

$$\min\left\{\frac{1}{3}\,(0.0814845\,b+1)^2\,M^2\right\} = 0 \text{ at } (b,M) = (-16,0)$$

Global minima:

$$\min\left\{\frac{1}{3}\,M^2\left(1 - \frac{(b\,2)\left(0.9991104684 - \frac{\sqrt{6}}{2}\right)\exp\left(-\frac{2\left(0.9991104684 - \frac{\sqrt{6}}{2}\right)}{\sqrt{6}}\right)}{e\,\sqrt{6}}\right)^2\right\} = 0$$

$$\text{for } b = -\frac{226\,802\,245}{18\,480\,874}$$

$$\min\left\{\frac{1}{3}M^2\left(1-\frac{(b\ 2)\left(0.9991104684-\frac{\sqrt{6}}{2}\right)\exp\left(-\frac{2\left(0.9991104684-\frac{\sqrt{6}}{2}\right)}{\sqrt{6}}\right)}{e\sqrt{6}}\right)^2\right\}=0$$

for $M=0$

From:

$$b=\frac{225.913\left(-0.054323\,M^2\pm 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}\quad (M\neq 0)$$

we obtain:

(225.913 (-0.054323 M^2 + 6.58545×10^-10 sqrt(M^4)))/M^2

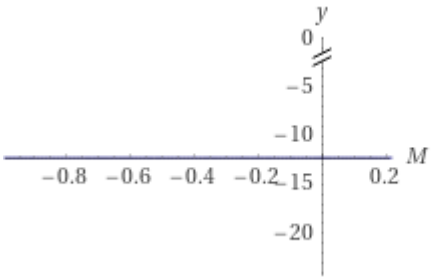
Input interpretation:

$$\frac{225.913\left(-0.054323\,M^2+6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}$$

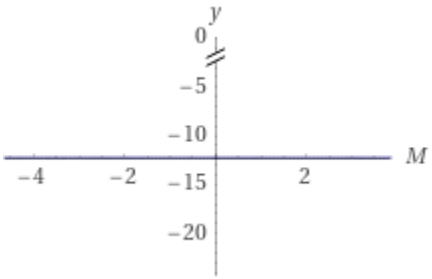
Result:

$$\frac{225.913\left(6.58545\times 10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}$$

Plots:



(*M* from −1 to 0.2)



(*M* from −4.6 to 3.9)

Alternate form assuming M is real:

-12.2723

-12.2723 result very near to the black hole entropy value 12.1904 = ln(196884)

Alternate forms:

$$-\frac{12.2723\left(M^2-1.21228\times10^{-8}\sqrt{M^4}\right)}{M^2}$$

$$\frac{1.48774\times10^{-7}\sqrt{M^4}-12.2723\,M^2}{M^2}$$

Expanded form:

$$\frac{1.48774\times10^{-7}\sqrt{M^4}}{M^2}-12.2723$$

Property as a function:

Parity

even

Series expansion at M = 0:

$$\left(\frac{1.48774\times10^{-7}\sqrt{M^4}}{M^2}-12.2723\right)+O\left(M^6\right)$$

(generalized Puiseux series)

Series expansion at M = ∞:

$$-12.2723$$

Derivative:

$$\frac{d}{dM}\left(\frac{225.913\left(6.58545\times10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}\right)=\frac{3.55271\times10^{-15}}{M}$$

Indefinite integral:

$$\int\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}\,dM=$$
$$\frac{1.48774\times10^{-7}\sqrt{M^4}}{M}-12.2723\,M+\text{constant}$$

Global maximum:

$$\max\left\{\frac{225.913\left(6.58545\times10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}\right\}=$$
$$-\frac{140\,119\,826\,723\,990\,341\,497\,649}{11\,417\,594\,849\,251\,000\,000\,000}\ \text{at}\ M=-1$$

Global minimum:

$$\min\left\{\frac{225.913\left(6.58545\times10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}\right\}=$$
$$-\frac{140\,119\,826\,723\,990\,341\,497\,649}{11\,417\,594\,849\,251\,000\,000\,000}\ \text{at}\ M=-1$$

Limit:

$$\lim_{M\to\pm\infty}\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}=-12.2723$$

Definite integral after subtraction of diverging parts:

$$\int_0^{\infty}\left(\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}--12.2723\right)dM=0$$

From b that is equal to

$$\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}$$

From:

$$V = \frac{1}{3}(0.0814845\,b + 1)^2\,M^2$$

we obtain:

1/3 (0.0814845 ((225.913 (-0.054323 M^2 + 6.58545×10^-10 sqrt(M^4)))/M^2) + 1)^2 M^2

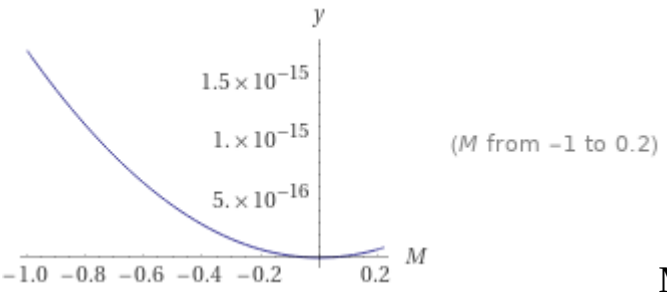
Input interpretation:

$$\frac{1}{3}\left(0.0814845 \times \frac{225.913\left(-0.054323\,M^2 + 6.58545 \times 10^{-10}\sqrt{M^4}\right)}{M^2} + 1\right)^2 M^2$$

Result:

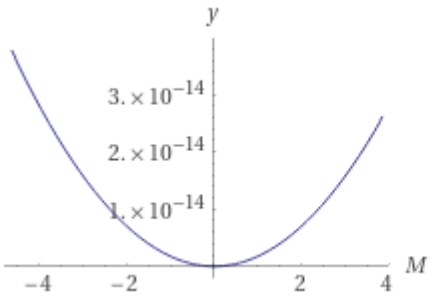
0

Plots: **(possible mathematical connection with an open string)**



M = -0.5; M = 0.2

(possible mathematical connection with an open string)



(*M* from −4.6 to 3.9)

M = 2 ; M = 3

Root:

$M = 0$

Property as a function:

Parity

even

Series expansion at M = 0:

$O\left(M^{62194}\right)$

(Taylor series)

Series expansion at M = ∞:

$1.75541 \times 10^{-15}\, M^2 + O\left(\left(\frac{1}{M}\right)^{62194}\right)$

(Taylor series)

Definite integral after subtraction of diverging parts:

$$\int_0^{\infty}\left(\frac{1}{3}M^2\left(1+\frac{18.4084\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}\right)^2-1.75541\times10^{-15}\,M^2\right)dM=0$$

For M = - 0.5 , we obtain:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 (-0.5)^2 + 6.58545×10^-10 sqrt((-0.5)^4)))/(-0.5)^2) + 1)^2 * (-0.5^2)

Input interpretation:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,(-0.5)^2+6.58545\times10^{-10}\sqrt{(-0.5)^4}\right)}{(-0.5)^2}+1\right)^2\left(-0.5^2\right)$$

Result:

$$-4.388513449474645453489707833780880208333333333333333333\ldots\times10^{-16}$$

-4.38851344947*10^{-16}

For M = 0.2:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 0.2^2 + 6.58545×10^-10 sqrt(0.2^4)))/0.2^2) + 1)^2 0.2^2

Input interpretation:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\times0.2^2+6.58545\times10^{-10}\sqrt{0.2^4}\right)}{0.2^2}+1\right)^2\times0.2^2$$

Result:

$7.021621519159432725583532534049408333333333333333333333333\ldots\times 10^{-17}$

7.021621519159*10^-17

For M = 3:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 3^2 + 6.58545×10^-10 sqrt(3^4)))/3^2) + 1)^2 3^2

Input interpretation:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\times3^2+6.58545\times10^{-10}\sqrt{3^4}\right)}{3^2}+1\right)^2\times3^2$$

Result:

$1.579864841810872363256294820161116875 \times 10^{-14}$

1.57986484181*10^-14

For M = 2:

$$\frac{1}{3}\left(0.0814845 \times \frac{225.913\left(-0.054323\, M^2 + 6.58545 \times 10^{-10}\sqrt{M^4}\right)}{M^2} + 1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 2^2 + 6.58545×10^-10 sqrt(2^4)))/2^2) + 1)^2 2^2

Input interpretation:

$$\frac{1}{3}\left(0.0814845 \times \frac{225.913\left(-0.054323 \times 2^2 + 6.58545 \times 10^{-10}\sqrt{2^4}\right)}{2^2} + 1\right)^2 \times 2^2$$

Result:

$7.021621519159432725583532534049408333333333333333333333333\ldots \times 10^{-15}$

7.021621519*10^-15

From the four results

7.021621519*10^-15 ; 1.57986484181*10^-14 ; 7.021621519159*10^-17 ;

-4.38851344947*10^-16

we obtain, after some calculations:

sqrt[1/(2Pi)(7.021621519*10^-15 + 1.57986484181*10^-14 +7.021621519*10^-17 - 4.38851344947*10^-16)]

Input interpretation:

$$\sqrt{\left(\frac{1}{2\pi}\left(7.021621519\times 10^{-15}+1.57986484181\times 10^{-14}+7.021621519\times 10^{-17}-4.38851344947\times 10^{-16}\right)\right)}$$

Result:

$5.9776991059\ldots\times 10^{-8}$

5.9776991059*10^-8 result very near to the Planck's electric flow 5.975498×10^{-8} that is equal to the following formula:

$$\phi_{\mathrm{P}}^{E}=\mathbf{E}_{\mathrm{P}}l_{\mathrm{P}}^{2}=\phi_{\mathrm{P}}l_{\mathrm{P}}=\sqrt{\frac{\hbar c}{\varepsilon_0}}$$

We note that:

1/55*(([(((1/[(7.021621519*10^-15 + 1.57986484181*10^-14 +7.021621519*10^-17 -4.38851344947*10^-16)])))^1/7]-((log^(5/8)(2))/(2 2^(1/8) 3^(1/4) e log^(3/2)(3)))))

Input interpretation:

$$\frac{1}{55}\left((1/(7.021621519\times 10^{-15} + 1.57986484181\times 10^{-14} + 7.021621519\times 10^{-17} - 4.38851344947\times 10^{-16}))\,\hat{}\,(1/7) - \frac{\log^{5/8}(2)}{2\sqrt[8]{2}\,\sqrt[4]{3}\,e\log^{3/2}(3)}\right)$$

$\log(x)$ is the natural logarithm

Result:

1.6181818182…

1.6181818182… result that is a very good approximation to the value of the golden ratio 1.618033988749...

From the Planck units:

Planck Length

$$l_{\mathrm{P}} = \sqrt{\frac{4\pi\hbar G}{c^3}}$$

5.729475 * 10^{-35} Lorentz-Heaviside value

Planck's Electric field strength

$$\mathbf{E}_{\mathrm{P}} = \frac{F_{\mathrm{P}}}{q_{\mathrm{P}}} = \sqrt{\frac{c^7}{16\pi^2\varepsilon_0\hbar G^2}}$$

1.820306 * 10^{61} V*m Lorentz-Heaviside value

Planck's Electric flux

$$\phi_{\mathrm{P}}^{E} = \mathbf{E}_{\mathrm{P}} l_{\mathrm{P}}^2 = \phi_{\mathrm{P}} l_{\mathrm{P}} = \sqrt{\frac{\hbar c}{\varepsilon_0}}$$

5.975498*10^{-8} V*m Lorentz-Heaviside value

Planck's Electric potential

$$\phi_P = V_P = \frac{E_P}{q_P} = \sqrt{\frac{c^4}{4\pi\varepsilon_0 G}}$$

1.042940*10^{27} V Lorentz-Heaviside value

Relationship between Planck's Electric Flux and Planck's Electric Potential

$E_P * l_P = (1.820306 * 10^{61}) * 5.729475 * 10^{-35}$

Input interpretation:

$$\frac{(1.820306 \times 10^{61}) \times 5.729475}{10^{35}}$$

Result:

1 042 939 771 935 000 000 000 000 000

Scientific notation:

$1.042939771935 \times 10^{27}$

$1.042939771935*10^{27} \approx 1.042940*10^{27}$

Or:

$E_P * l_P^2 / l_P = (5.975498*10^{-8})*1/(5.729475 * 10^{-35})$

Input interpretation:

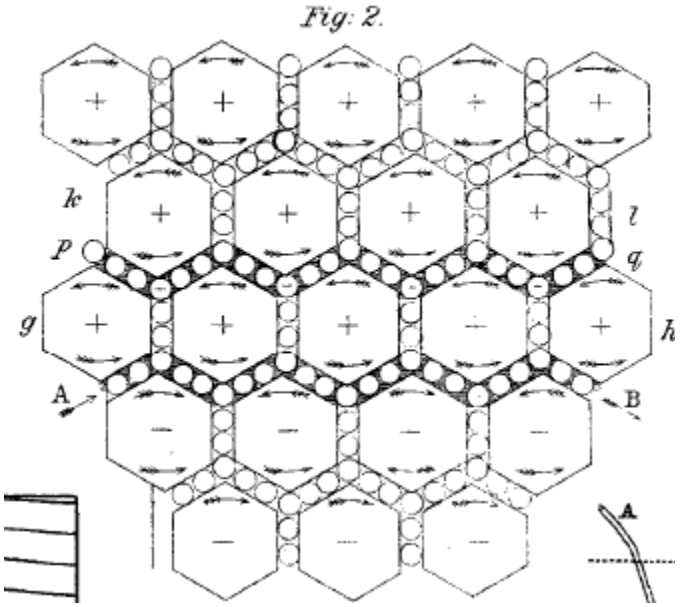
$$5.975498 \times 10^{-8} \times \frac{1}{\frac{5.729475}{10^{35}}}$$

Result:

$1.042939885417075735560413475929295441554418162222542205001 33\ldots \times 10^{27}$

$1.042939885417*10^{27} \approx 1.042940*10^{27}$

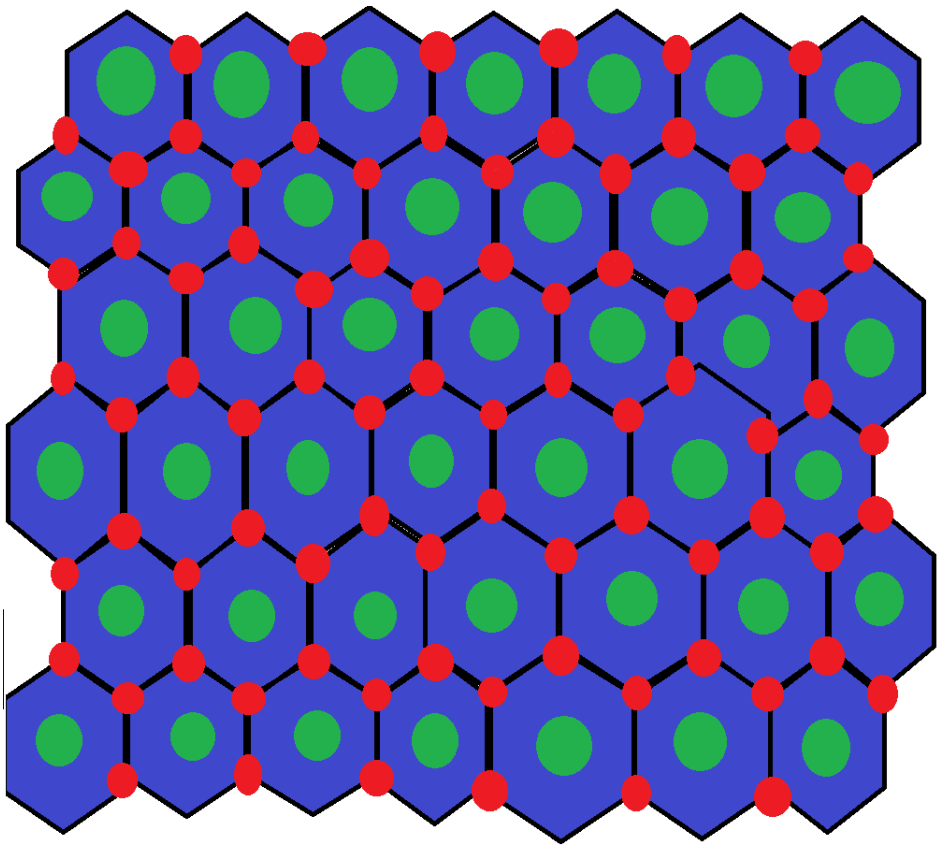
Fig. 1



It is therefore possible to consider the vortices of the "quantum vacuum" schematized as cubes or octahedrons (the + sign inside a given vortex indicates its counterclockwise rotation, while the - sign indicates its clockwise rotation). Between vortex and vortex there is a layer of "bubbles"-universes (or universes-spheres), which flows, as in the simplified two-dimensional drawing, from A to B

Fig. 2

Immagine dello Spazio-Tempo a scala quantistica: le cironferenze in rosso rappresentano i punti corrispondenti alle dimensioni compattificate e gli esagoni in blu, rappresentano le “fluttuazioni” (universi potenziali – cerchi verdi) del vuoto quantistico (2D)



Proposal

Image of space-time at quantum scale: the circles in red represent the points corresponding to the compactified dimensions and the hexagons in blue, represent the "fluctuations" (potential universes - green circles) of the quantum vacuum (2D). In reality, we will have n-dimensional hyperspheres in which the compactified dimensions "roll up" and octahedrons representing the "fluctuations", containing spheres (bubbles of potential universes), of the quantum vacuum

Acknowledgments

We would like to thank Professor **Augusto Sagnotti** theoretical physicist at Scuola Normale Superiore (Pisa – Italy) for his very useful explanations and his availability.

References

A 4D IIB Flux Vacuum and Supersymmetry Breaking - II. Bosonic Spectrum and Stability - *J. Mourad and A. Sagnotti* - arXiv:2309.04026v1 [hep-th] 7 Sep 2023

A Number Theoretic Analysis of the Enthalpy, Enthalpy Energy Density, Thermodynamic Volume, and the Equation of State of a Modified White Hole, and the Implications to the Quantum Vacuum Spacetime, Matter Creation and the Planck Frequency. - *Nardelli, M., Kubeka, A.S. and Amani, A.* (2024) - Journal of Modern Physics , 15, 1-50. - https://doi.org/10.4236/jmp.2024.151001

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

An Update on Brane Supersymmetry Breaking - *Jihad Mourad and Augusto Sagnotti* - arXiv:1711.11494v1 [hep-th] 30 Nov 2017

Properties of Nilpotent Supergravity - *E. Dudas, S. Ferrara, A. Kehagias and A. Sagnotti* - arXiv:1507.07842v2 [hep-th] 14 Sep 2015

See also:

The Geometry of the MRB constant *by Marvin Ray Burns*

https://www.academia.edu/22271085/The_Geometry_of_the_MRB_constant

(See also Page 29 the applications of the CMRB in various sectors of Theoretical Physics (String Theory) and Cosmology)

http://xoom.virgilio.it/source_filemanager/na/ar/nardelli/michele%20and%20antonio%20papers/Try%20to%20beat%20these%20MRB%20constant%20records!%20-%20Online%20Technical%20Discussion%20Groups%E2%80%94Wolfram%20Community%20b.pdf