On the study of various equations concerning the Isoperimetric Theorems. Possible mathematical connections with some sectors of Number Theory and Eternal Inflation model.

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Abstract

In this paper, we analyze various equations concerning the Isoperimetric Theorems. We describe the new possible mathematical connections with some sectors of Number Theory and Eternal Inflation model

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Introduction

In 1983, it was shown that inflation could be eternal, leading to a multiverse in which space is broken up into bubbles or patches whose properties differ from patch to patch spanning all physical possibilities.

When the false vacuum decays, the lower-energy true vacuum forms through a process known as **bubble nucleation**. In this process, instanton effects cause a bubble containing the true vacuum to appear. The walls of the bubble (or domain walls) have a positive surface tension, as energy is expended as the fields roll over the potential barrier to the true vacuum.

In mathematics, a **ball** is the space bounded by a sphere. It may be a **closed ball** (including the boundary points that constitute the sphere) or an **open ball** (excluding them). (From Wikipedia)

We propose that some equations concerning the "balls", thus various sectors and theorems of Geometric Measure Theory, can be related with several parameters of some cosmological models as the "Multiverse" and the "Eternal Inflation" linked to it, which provides that space is divided into bubbles or patches whose properties differ from patch to patch and spanning all physical possibilities.

From:

Isoperimetry and Stability Properties of Balls with Respect to Nonlocal Energies
A. Figalli, N. Fusco, F. Maggi, V. Millot, M. Morini - Commun. Math. Phys Digital Object Identifier (DOI) 10.1007/s00220-014-2244-1

We have that:

In the recent paper [7], Caffarelli, Roquejoffre, and Savin have initiated the study of Plateau-type problems with respect to a family of nonlocal perimeter functionals. A regularity theory for such nonlocal minimal surfaces has been developed by several authors [4,10,12,18,35], while the relation of nonlocal perimeters with their local counterpart has been investigated in [3,8]. The isoperimetry of balls in nonlocal isoperimetric problems has been addressed in [19]. Precisely, given $s \in (0, 1)$ and $n \geq 2$, one defines the s-perimeter of a set $E \subset \mathbb{R}^n$ as

$$P_s(E) := \int_E \int_{E^c} \frac{dx\, dy}{|x-y|^{n+s}} \in [0, \infty].$$

As proved in [19], if $0 < |E| < \infty$ then we have the nonlocal isoperimetric inequality

$$P_s(E) \geq \frac{P_s(B)}{|B|^{(n-s)/n}} |E|^{(n-s)/n}, \tag{1.1}$$

where $B_r := \{x \in \mathbb{R}^n : |x| < r\}$, $B := B_1$, and $|E|$ is the Lebesgue measure of E.

In this section we consider the family of functionals $\mathrm{Per}_s + \beta V_\alpha$ ($\beta > 0$) and discuss in terms of the value of β the volume-constrained stability of $\mathrm{Per}_s + \beta V_\alpha$ around the unit ball B. Our interest in this problem lies in the fact that, as we shall prove in Sect. 8, stability is actually a necessary and sufficient condition for volume-constrained local minimality. Therefore the analysis carried on in this section will provide the basis for the proof of Theorem 1.5. We set

$$\beta_\star(n,s,\alpha) := \begin{cases} \dfrac{1-s}{\omega_{n-1}} \inf\limits_{k\geq 2} \dfrac{\lambda_k^s - \lambda_1^s}{\mu_k^\alpha - \mu_1^\alpha}, & \text{if } s \in (0,1), \\ \inf\limits_{k\geq 2} \dfrac{\lambda_k^1 - \lambda_1^1}{\mu_k^\alpha - \mu_1^\alpha}, & \text{if } s = 1, \end{cases} \tag{7.1}$$

where, for every $k \in \mathbb{N} \cup \{0\}$,

$$\lambda_k^1 = k(k+n-2), \tag{7.2}$$

$$\lambda_k^s = \frac{2^{1-s}\pi^{\frac{n-1}{2}}}{1+s}\frac{\Gamma(\frac{1-s}{2})}{\Gamma(\frac{n+s}{2})}\left(\frac{\Gamma(k+\frac{n+s}{2})}{\Gamma(k+\frac{n-2-s}{2})} - \frac{\Gamma(\frac{n+s}{2})}{\Gamma(\frac{n-2-s}{2})}\right), \quad s \in (0,1), \tag{7.3}$$

$$\mu_k^\alpha = \frac{2^{1+\alpha}\pi^{\frac{n-1}{2}}}{1-\alpha}\frac{\Gamma(\frac{1+\alpha}{2})}{\Gamma(\frac{n-\alpha}{2})}\left(\frac{\Gamma(k+\frac{n-\alpha}{2})}{\Gamma(k+\frac{n-2+\alpha}{2})} - \frac{\Gamma(\frac{n-\alpha}{2})}{\Gamma(\frac{n-2+\alpha}{2})}\right), \quad \alpha \in (0,1), \tag{7.4}$$

$$\mu_k^\alpha = 2^\alpha \pi^{\frac{n-1}{2}}\frac{\Gamma(\frac{\alpha-1}{2})}{\Gamma(\frac{n-\alpha}{2})}\left(\frac{\Gamma(\frac{n-\alpha}{2})}{\Gamma(\frac{n-2+\alpha}{2})} - \frac{\Gamma(k+\frac{n-\alpha}{2})}{\Gamma(k+\frac{n-2+\alpha}{2})}\right), \quad \alpha \in (1,n), \tag{7.5}$$

$$\mu_k^1 = \frac{4\pi^{\frac{n-1}{2}}}{\Gamma(\frac{n-1}{2})}\left(\frac{\Gamma'(k+\frac{n-1}{2})}{\Gamma(k+\frac{n-1}{2})} - \frac{\Gamma'(\frac{n-1}{2})}{\Gamma(\frac{n-1}{2})}\right). \tag{7.6}$$

Here Γ denotes the Euler's Gamma function, while Γ' is the derivative of Γ, so that Γ'/Γ is the digamma function. By exploiting basic properties of the Gamma function, it is straightforward to check that $\lambda_k^s/\mu_k^\alpha \to \infty$ as $k \to \infty$, so that the infimum in (7.1) is achieved, and $\beta_\star > 0$. We shall actually prove that the infimum is always achieved at $k = 2$ and the formula for $\beta_\star$ considerably simplifies (see Proposition 7.4).

Now, we analyze the eqs. (7.2), (7.3), (7.4), (7.5) and (7.6)

For n = 3, k = 2, s = α = 1/2 , from

$$\lambda_k^1 = k(k+n-2),$$

we obtain:

2(2+3-2) = 6

From:

$$\lambda_k^s = \frac{2^{1-s}\pi^{\frac{n-1}{2}}}{1+s}\frac{\Gamma(\frac{1-s}{2})}{\Gamma(\frac{n+s}{2})}\left(\frac{\Gamma(k+\frac{n+s}{2})}{\Gamma(k+\frac{n-2-s}{2})} - \frac{\Gamma(\frac{n+s}{2})}{\Gamma(\frac{n-2-s}{2})}\right), \qquad s \in (0,1),$$

we obtain:

(2^(1-0.5)*Pi)/(1+1/2)* gamma(1/2*(1-1/2))/gamma(1/2*(3+1/2))*(((((gamma(2+1/2(3+1/2)))/gamma(2+1/2(3-2-1/2))-gamma(1/2(3+1/2))/gamma(1/2(3-2-1/2)))))

Input

$$\frac{2^{1-0.5}\pi}{1+\frac{1}{2}} \times \frac{\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)} - \frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)$$

$\Gamma(x)$ is the gamma function

Result

42.6517…

42.6517…

The study of this function provides the following representations:

Alternative representations

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)} - \frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)} = \frac{\pi\left(-\frac{3}{4}\right)!\,2^{0.5}\left(-\frac{\frac{3}{4}!}{\left(-\frac{3}{4}\right)!} + \frac{\frac{11}{4}!}{\frac{5}{4}!}\right)}{\frac{3\times\frac{3}{4}!}{2}}$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)}=\frac{\pi\,G\left(\frac{5}{4}\right)2^{0.5}\left(-\frac{G\left(\frac{11}{4}\right)}{\frac{G\left(\frac{7}{4}\right)G\left(\frac{5}{4}\right)}{G\left(\frac{1}{4}\right)}}+\frac{G\left(\frac{19}{4}\right)}{\frac{G\left(\frac{15}{4}\right)G\left(\frac{13}{4}\right)}{G\left(\frac{9}{4}\right)}}\right)}{\frac{3\,G\left(\frac{1}{4}\right)G\left(\frac{11}{4}\right)}{2\,G\left(\frac{7}{4}\right)}}$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)}=\frac{\pi\,2^{0.5}\,e^{-\log G(1/4)+\log G(5/4)}\left(-\frac{e^{-\log G(7/4)+\log G(11/4)}}{e^{-\log G(1/4)+\log G(5/4)}}+\frac{e^{-\log G(15/4)+\log G(19/4)}}{e^{-\log G(9/4)+\log G(13/4)}}\right)}{\frac{3}{2}\,e^{-\log G(7/4)+\log G(11/4)}}$$

Series representations

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)}=\left(0.942809\,\pi\left(-\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{\left(\frac{7}{4}-z_0\right)^{k_1}\left(\frac{9}{4}-z_0\right)^{k_2}\Gamma^{(k_1)}(z_0)\,\Gamma^{(k_2)}(z_0)}{k_1!\,k_2!}+\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{\left(\frac{1}{4}-z_0\right)^{k_1}\left(\frac{15}{4}-z_0\right)^{k_2}\Gamma^{(k_1)}(z_0)\,\Gamma^{(k_2)}(z_0)}{k_1!\,k_2!}\right)\right)\Big/\left(\left(\sum_{k=0}^{\infty}\frac{\left(\frac{7}{4}-z_0\right)^{k}\Gamma^{(k)}(z_0)}{k!}\right)\sum_{k=0}^{\infty}\frac{\left(\frac{9}{4}-z_0\right)^{k}\Gamma^{(k)}(z_0)}{k!}\right)\quad \text{for } (z_0\notin\mathbb{Z} \text{ or } z_0>0)$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)}=$$

$$-\left(\left(0.942809\,\pi\left(-\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\left(\frac{7}{4}-z_0\right)^{k_1}\left(\frac{9}{4}-z_0\right)^{k_2}\sum_{j_1=0}^{k_1}\sum_{j_2=0}^{k_2}\left((-1)^{j_1+j_2}\,\pi^{-j_1-j_2+k_1+k_2}\,\sin\left(\frac{1}{2}\,\pi\,(-j_1+k_1+2\,z_0)\right)\sin\left(\frac{1}{2}\,\pi\,(-j_2+k_2+2\,z_0)\right)\Gamma^{(j_1)}(1-z_0)\,\Gamma^{(j_2)}(1-z_0)\right)\Big/(j_1!\,j_2!\,(-j_1+k_1)!\,(-j_2+k_2)!)+\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\left(\frac{1}{4}-z_0\right)^{k_1}\left(\frac{15}{4}-z_0\right)^{k_2}\sum_{j_1=0}^{k_1}\sum_{j_2=0}^{k_2}\left((-1)^{j_1+j_2}\,\pi^{-j_1-j_2+k_1+k_2}\,\sin\left(\frac{1}{2}\,\pi\,(-j_1+k_1+2\,z_0)\right)\sin\left(\frac{1}{2}\,\pi\,(-j_2+k_2+2\,z_0)\right)\Gamma^{(j_1)}(1-z_0)\,\Gamma^{(j_2)}(1-z_0)\right)\Big/(j_1!\,j_2!\,(-j_1+k_1)!\,(-j_2+k_2)!)\right)\right)\Big/\left(\left(\sum_{k=0}^{\infty}\left(\frac{1}{4}-z_0\right)^{k}\sum_{j=0}^{k}\frac{(-1)^j\,\pi^{-j+k}\,\sin\left(\frac{1}{2}\,\pi\,(-j+k+2\,z_0)\right)\Gamma^{(j)}(1-z_0)}{j!\,(-j+k)!}\right)\sum_{k=0}^{\infty}\left(\frac{15}{4}-z_0\right)^{k}\sum_{j=0}^{k}\frac{(-1)^j\,\pi^{-j+k}\,\sin\left(\frac{1}{2}\,\pi\,(-j+k+2\,z_0)\right)\Gamma^{(j)}(1-z_0)}{j!\,(-j+k)!}\right)\right)$$

Integral representations

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)}=$$

$$-0.942809\,\pi+0.942809\exp\left(\int_0^1\frac{\sqrt[4]{x}\,\left(-1-x+x^{3/2}+x^{5/2}\right)}{\log(x)}\,dx\right)\pi$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)} =$$

$$-0.942809\,\pi + 0.942809\exp\left(\int_0^1 \frac{\sqrt[4]{x}-x^{7/4}-x^{9/4}+x^{15/4}-\log\left(\sqrt[4]{x}\right)+\log\left(x^{7/4}\right)+\log\left(x^{9/4}\right)-\log\left(x^{15/4}\right)}{(-1+x)\log(x)}\,dx\right)\pi$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1-\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2-\frac{1}{2}\right)\right)}\right)\right)\left(2^{1-0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3+\frac{1}{2}\right)\right)\left(1+\frac{1}{2}\right)} =$$

$$\frac{0.942809\,\pi\left(\int_0^1\int_0^1 \log^{3/4}\left(\frac{1}{t_1}\right)\log^{5/4}\left(\frac{1}{t_2}\right)dt_2\,dt_1+\int_0^1\int_0^1\frac{\log^{11/4}\left(\frac{1}{t_2}\right)}{\log^{3/4}\left(\frac{1}{t_1}\right)}\,dt_2\,dt_1\right)}{\left(\int_0^1\log^{3/4}\left(\frac{1}{t}\right)dt\right)\int_0^1\log^{5/4}\left(\frac{1}{t}\right)dt}$$

For n = 3, k = 2, α = 1/2

From:

$$\mu_k^\alpha = \frac{2^{1+\alpha}\,\pi^{\frac{n-1}{2}}}{1-\alpha}\,\frac{\Gamma(\frac{1+\alpha}{2})}{\Gamma(\frac{n-\alpha}{2})}\left(\frac{\Gamma(k+\frac{n-\alpha}{2})}{\Gamma(k+\frac{n-2+\alpha}{2})}-\frac{\Gamma(\frac{n-\alpha}{2})}{\Gamma(\frac{n-2+\alpha}{2})}\right),\quad \alpha\in(0,1),$$

we obtain:

(2^(1+0.5)*Pi)/(1-1/2)* gamma(1/2*(1+1/2))/gamma(1/2*(3-1/2))*(((((gamma(2+1/2(3-1/2)))/gamma(2+1/2(3-2+1/2))-gamma(1/2(3-1/2))/gamma(1/2(3-2+1/2)))))

Input

$$\frac{2^{1+0.5}\,\pi}{1-\frac{1}{2}} \times \frac{\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)} - \frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)$$

$\Gamma(x)$ is the gamma function

Result

20.3103…

20.3103…

The study of this function provides the following representations:

Alternative representations

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)} - \frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)} = \frac{\pi\left(-\frac{1}{4}\right)!\,2^{1.5}\left(-\frac{\frac{1}{4}!}{\left(-\frac{1}{4}\right)!}+\frac{\frac{9}{4}!}{\frac{7}{4}!}\right)}{\frac{\frac{1}{4}!}{2}}$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)} - \frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)} = \frac{\pi\,G\left(\frac{7}{4}\right)2^{1.5}\left(-\frac{G\left(\frac{9}{4}\right)}{\frac{G\left(\frac{5}{4}\right)G\left(\frac{7}{4}\right)}{G\left(\frac{3}{4}\right)}}+\frac{G\left(\frac{17}{4}\right)}{\frac{G\left(\frac{13}{4}\right)G\left(\frac{15}{4}\right)}{G\left(\frac{11}{4}\right)}}\right)}{\frac{G\left(\frac{3}{4}\right)G\left(\frac{9}{4}\right)}{2\,G\left(\frac{5}{4}\right)}}$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)}=$$

$$\frac{\pi\,2^{1.5}\,e^{-\log G(3/4)+\log G(7/4)}\left(-\frac{e^{-\log G(5/4)+\log G(9/4)}}{e^{-\log G(3/4)+\log G(7/4)}}+\frac{e^{-\log G(13/4)+\log G(17/4)}}{e^{-\log G(11/4)+\log G(15/4)}}\right)}{\frac{1}{2}\,e^{-\log G(5/4)+\log G(9/4)}}$$

Series representations

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)}=$$

$$\left(5.65685\,\pi\left(-\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{\left(\frac{5}{4}-z_0\right)^{k_1}\left(\frac{11}{4}-z_0\right)^{k_2}\Gamma^{(k_1)}(z_0)\,\Gamma^{(k_2)}(z_0)}{k_1!\,k_2!}+\right.\right.$$
$$\left.\left.\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{\left(\frac{3}{4}-z_0\right)^{k_1}\left(\frac{13}{4}-z_0\right)^{k_2}\Gamma^{(k_1)}(z_0)\,\Gamma^{(k_2)}(z_0)}{k_1!\,k_2!}\right)\right)\Big/$$
$$\left(\left(\sum_{k=0}^{\infty}\frac{\left(\frac{5}{4}-z_0\right)^{k}\Gamma^{(k)}(z_0)}{k!}\right)\sum_{k=0}^{\infty}\frac{\left(\frac{11}{4}-z_0\right)^{k}\Gamma^{(k)}(z_0)}{k!}\right)\quad\text{for }(z_0\notin\mathbb{Z}\text{ or }z_0>0)$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)}=$$

$$-\left(\left(5.65685\,\pi\left(-\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\left(\frac{5}{4}-z_0\right)^{k_1}\left(\frac{11}{4}-z_0\right)^{k_2}\sum_{j_1=0}^{k_1}\sum_{j_2=0}^{k_2}\left((-1)^{j_1+j_2}\,\pi^{-j_1-j_2+k_1+k_2}\sin\left(\frac{1}{2}\pi(-j_1+k_1+2z_0)\right)\sin\left(\frac{1}{2}\pi(-j_2+k_2+2z_0)\right)\Gamma^{(j_1)}(1-z_0)\,\Gamma^{(j_2)}(1-z_0)\right)\Big/(j_1!\,j_2!\,(-j_1+k_1)!\,(-j_2+k_2)!)+\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\left(\frac{3}{4}-z_0\right)^{k_1}\left(\frac{13}{4}-z_0\right)^{k_2}\sum_{j_1=0}^{k_1}\sum_{j_2=0}^{k_2}\left((-1)^{j_1+j_2}\,\pi^{-j_1-j_2+k_1+k_2}\sin\left(\frac{1}{2}\pi(-j_1+k_1+2z_0)\right)\sin\left(\frac{1}{2}\pi(-j_2+k_2+2z_0)\right)\Gamma^{(j_1)}(1-z_0)\,\Gamma^{(j_2)}(1-z_0)\right)\Big/(j_1!\,j_2!\,(-j_1+k_1)!\,(-j_2+k_2)!)\right)\right)\Big/\left(\left(\sum_{k=0}^{\infty}\left(\frac{3}{4}-z_0\right)^k\sum_{j=0}^{k}\frac{(-1)^j\,\pi^{-j+k}\sin\left(\frac{1}{2}\pi(-j+k+2z_0)\right)\Gamma^{(j)}(1-z_0)}{j!\,(-j+k)!}\right)\sum_{k=0}^{\infty}\left(\frac{13}{4}-z_0\right)^k\sum_{j=0}^{k}\frac{(-1)^j\,\pi^{-j+k}\sin\left(\frac{1}{2}\pi(-j+k+2z_0)\right)\Gamma^{(j)}(1-z_0)}{j!\,(-j+k)!}\right)\right)$$

Integral representations

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)}=$$

$$-5.65685\,\pi+5.65685\exp\left(\int_0^1\frac{\left(-1+\sqrt{x}\right)x^{3/4}(1+x)}{\log(x)}\,dx\right)\pi$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)} =$$

$$-5.65685\,\pi + 5.65685\exp\left(\int_0^1 \frac{x^{3/4}-x^{5/4}-x^{11/4}+x^{13/4}-\log(x^{3/4})+\log(x^{5/4})+\log(x^{11/4})-\log(x^{13/4})}{(-1+x)\log(x)}\,dx\right)\pi$$

$$\frac{\left(\Gamma\left(\frac{1}{2}\left(1+\frac{1}{2}\right)\right)\left(\frac{\Gamma\left(2+\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(2+\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}-\frac{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)}{\Gamma\left(\frac{1}{2}\left(3-2+\frac{1}{2}\right)\right)}\right)\right)\left(2^{1+0.5}\,\pi\right)}{\Gamma\left(\frac{1}{2}\left(3-\frac{1}{2}\right)\right)\left(1-\frac{1}{2}\right)} =$$

$$\frac{5.65685\,\pi\left(\int_0^1\int_0^1 \sqrt[4]{\log\left(\frac{1}{t_1}\right)}\,\log^{7/4}\left(\frac{1}{t_2}\right)dt_2\,dt_1+\int_0^1\int_0^1 \frac{\log^{9/4}\left(\frac{1}{t_2}\right)}{\sqrt[4]{\log\left(\frac{1}{t_1}\right)}}\,dt_2\,dt_1\right)}{\left(\int_0^1\sqrt[4]{\log\left(\frac{1}{t}\right)}\,dt\right)\int_0^1\log^{7/4}\left(\frac{1}{t}\right)dt}$$

For n = 3, k = 2, α = 2

From:

$$\mu_k^\alpha = 2^\alpha\,\pi^{\frac{n-1}{2}}\,\frac{\Gamma(\frac{\alpha-1}{2})}{\Gamma(\frac{n-\alpha}{2})}\left(\frac{\Gamma(\frac{n-\alpha}{2})}{\Gamma(\frac{n-2+\alpha}{2})}-\frac{\Gamma(k+\frac{n-\alpha}{2})}{\Gamma(k+\frac{n-2+\alpha}{2})}\right), \qquad \alpha\in(1,n),$$

we obtain:

(2^2*Pi)*gamma(1/2*(2-1))/gamma(1/2*(3-2))*(((((gamma(1/2(3-2)))/gamma(1/2(3-2+2))-gamma(2+1/2(3-2))/gamma(2+1/2(3-2+2)))))

Input

$$(2^2 \pi) \times \frac{\Gamma\left(\frac{1}{2}(2-1)\right)}{\Gamma\left(\frac{1}{2}(3-2)\right)} \left(\frac{\Gamma\left(\frac{1}{2}(3-2)\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)} - \frac{\Gamma\left(2+\frac{1}{2}(3-2)\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)} \right)$$

$\Gamma(x)$ is the gamma function

Exact result

$$\frac{32\pi}{5}$$

Decimal approximation

20.10619298297467672616091765298881845886188415600067725423964539 0
…

20.106192982….

The study of this function provides the following representations:

Property

$\frac{32\pi}{5}$ is a transcendental number

Alternative representations

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)} - \frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \frac{4\pi\left(-\frac{1}{2}\right)!\left(\frac{\left(-\frac{1}{2}\right)!}{\frac{1}{2}!} - \frac{\frac{3}{2}!}{\frac{5}{2}!}\right)}{\left(-\frac{1}{2}\right)!}$$

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)} - \frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \frac{4\pi e^{-\log G(1/2)+\log G(3/2)}\left(\frac{e^{-\log G(1/2)+\log G(3/2)}}{e^{-\log G(3/2)+\log G(5/2)}} - \frac{e^{-\log G(5/2)+\log G(7/2)}}{e^{-\log G(7/2)+\log G(9/2)}}\right)}{e^{-\log G(1/2)+\log G(3/2)}}$$

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \frac{4\pi\,\Gamma\left(\frac{1}{2},0\right)\left(\frac{\Gamma\left(\frac{1}{2},0\right)}{\Gamma\left(\frac{3}{2},0\right)}-\frac{\Gamma\left(\frac{5}{2},0\right)}{\Gamma\left(\frac{7}{2},0\right)}\right)}{\Gamma\left(\frac{1}{2},0\right)}$$

Series representations

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \frac{128}{5}\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \sum_{k=0}^{\infty}\frac{128(-1)^k\left(956\times 5^{-2k}-5\times 239^{-2k}\right)}{5975(1+2k)}$$

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \frac{32}{5}\sum_{k=0}^{\infty}\left(-\frac{1}{4}\right)^k\left(\frac{1}{1+2k}+\frac{2}{1+4k}+\frac{1}{3+4k}\right)$$

Integral representations

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)} = \frac{128}{5}\int_0^1\sqrt{1-t^2}\,dt$$

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)}=\frac{64}{5}\int_0^1\frac{1}{\sqrt{1-t^2}}\,dt$$

$$\frac{\left(\Gamma\left(\frac{2-1}{2}\right)\left(\frac{\Gamma\left(\frac{3-2}{2}\right)}{\Gamma\left(\frac{1}{2}(3-2+2)\right)}-\frac{\Gamma\left(2+\frac{3-2}{2}\right)}{\Gamma\left(2+\frac{1}{2}(3-2+2)\right)}\right)\right)2^2\pi}{\Gamma\left(\frac{3-2}{2}\right)}=\frac{64}{5}\int_0^\infty\frac{1}{1+t^2}\,dt$$

For n = 3

from:

$$\mu_k^1=\frac{4\pi^{\frac{n-1}{2}}}{\Gamma(\frac{n-1}{2})}\left(\frac{\Gamma'(k+\frac{n-1}{2})}{\Gamma(k+\frac{n-1}{2})}-\frac{\Gamma'(\frac{n-1}{2})}{\Gamma(\frac{n-1}{2})}\right).$$

we obtain:

(2^2*Pi)/gamma(1/2(3-1))*(((((digamma(2+1)))/gamma(2+1/2(3-1))-digamma(1/2(3-1))/gamma(1/2(3-1)))))

Input

$$\frac{2^2\pi}{\Gamma\left(\frac{1}{2}(3-1)\right)}\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{1}{2}(3-1)\right)}-\frac{\psi\left(\frac{1}{2}(3-1)\right)}{\Gamma\left(\frac{1}{2}(3-1)\right)}\right)$$

$\Gamma(x)$ is the gamma function

$\psi(x)$ is the digamma function

Exact result

$$4\left(\frac{1}{2}\left(\frac{3}{2}-\gamma\right)+\gamma\right)\pi$$

γ is the Euler-Mascheroni constant

Decimal approximation

13.051530945552586714614199212380588690806836560870519080197129933

…

13.051530945…

The study of this function provides the following representations:

Alternate forms

$$(3+2\gamma)\pi$$

$$2\left(\frac{3}{2}-\gamma\right)\pi+4\gamma\pi$$

Expanded form

$$3\pi+2\gamma\pi$$

Alternative representations

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)}-\frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\pi)}{\Gamma\left(\frac{3-1}{2}\right)}=\frac{4\pi\left(-\frac{\psi(1)}{\frac{1}{1}}+\frac{\psi(3)}{2\times\frac{1}{1}}\right)}{\frac{1}{1}}$$

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)}-\frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\pi)}{\Gamma\left(\frac{3-1}{2}\right)}=\frac{4\pi\left(-\frac{\psi(1)}{e^0}+\frac{\psi(3)}{e^{\log(2)}}\right)}{e^0}$$

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = \frac{4\,\pi\left(-\frac{\frac{\partial 0!}{\partial 1}}{0!\times\frac{1}{1}} + \frac{\frac{\partial 2!}{\partial 3}}{2!\times 2}\right)}{\frac{1}{1}}$$

$\psi^{(n)}(x)$ is the n^{th} derivative of the digamma function

Series representations

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = 5\,\pi + 2\,\pi\sum_{k=2}^{\infty}\left(\frac{1}{k} + \log\left(\frac{-1+k}{k}\right)\right)$$

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = 3\,\pi + 2\,\pi\sum_{k=1}^{\infty}\left(\frac{1}{k} - \log\left(1+\frac{1}{k}\right)\right)$$

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = \pi\left(3 + 2\sum_{k=1}^{\infty} k \sum_{j=2^k}^{-1+2^{1+k}} \frac{(-1)^j}{j}\right)$$

Integral representations

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = 3\,\pi - 2\,\pi\int_{-\infty}^{\infty} e^{-e^t+t}\,t\,dt$$

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = -2\left(-3 + 2\int_{-\infty}^{\infty} e^{-e^t+t}\, t\, dt\right)\int_0^{\infty} \frac{1}{1+t^2}\, dt$$

$$\frac{\left(\frac{\psi(2+1)}{\Gamma\left(2+\frac{3-1}{2}\right)} - \frac{\psi\left(\frac{3-1}{2}\right)}{\Gamma\left(\frac{3-1}{2}\right)}\right)(2^2\,\pi)}{\Gamma\left(\frac{3-1}{2}\right)} = 2\left(\int_0^{\infty} \frac{1}{1+t^2}\, dt\right)\left(3 + 2\int_0^{\infty} \frac{-e^{-t} + \frac{1}{1+t}}{t}\, dt\right)$$

From the sum of the previous results/expressions, we obtain:

6+42.6517+20.3103+((32π)/5)+[((((4(1/2(3/2-0.5772156649)+0.5772156649)π))))]

Input interpretation

$$6 + 42.6517 + 20.3103 + \frac{32\,\pi}{5} + 4\left(\frac{1}{2}\left(\frac{3}{2} - 0.5772156649\right) + 0.5772156649\right)\pi$$

Result

102.120…

102.120….

The study of this function provides the following representations:

Alternative representations

$$6 + 42.6517 + 20.3103 + \frac{32\,\pi}{5} + 4\left(\frac{1}{2}\left(\frac{3}{2} - 0.577216\right) + 0.577216\right)\pi = 68.962 + 747.798\,° + \frac{5760\,°}{5}$$

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962-4.15443\, i\log(-1)-\frac{32}{5}\, i\log(-1)$$

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962+4.15443\cos^{-1}(-1)+\frac{32}{5}\cos^{-1}(-1)$$

Series representations

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962+42.2177\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 47.8531+21.1089\sum_{k=1}^{\infty}\frac{2^k}{\binom{2k}{k}}$$

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962+10.5544\sum_{k=0}^{\infty}\frac{2^{-k}(-6+50k)}{\binom{3k}{k}}$$

Integral representations

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962+21.1089\int_0^\infty \frac{1}{1+t^2}\,dt$$

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962+42.2177\int_0^1 \sqrt{1-t^2}\,dt$$

$$6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi = 68.962+21.1089\int_0^\infty \frac{\sin(t)}{t}\,dt$$

From which, we obtain:

17((6+42.6517+20.3103+((32π)/5)+[((((4(1/2(3/2-0.5772156649)+0.5772156649)π))))]))-e*Pi+φ

Input interpretation

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.5772156649\right)+0.5772156649\right)\pi\right)-e\pi+\phi$$

ϕ is the golden ratio

Result

1729.11…

1729.11….

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)

The study of this function provides the following representations:

Alternative representations

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\pi+\phi = -180^\circ e+2\cos\left(\frac{\pi}{5}\right)+17\left(68.962+747.798^\circ+\frac{5760^\circ}{5}\right)$$

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\pi+\phi = -e\pi+17\left(68.962+4.15443\pi+\frac{32\pi}{5}\right)+ \text{root of } -1-x+x^2 \text{ near } x=1.61803$$

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\pi+\phi = -180^\circ e+17\left(68.962+747.798^\circ+\frac{5760^\circ}{5}\right)+ \text{root of } -1-x+x^2 \text{ near } x=1.61803$$

Series representations

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\,\pi+\phi = 1172.35+\phi+717.701\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}-4\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1}}{k_2!\,(1+2k_1)}$$

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\,\pi+\phi = 1172.35+\phi+717.701\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}-4\sum_{k_1=0}^{\infty}\sum_{k_2=0}^{\infty}\frac{(-1)^{k_1}(-1+k_2)^2}{k_2!\,(1+2k_1)}$$

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\,\pi+\phi = 1172.35+\phi+179.425\times\sum_{k=1}^{\infty}4^{-k}\left(-1+3^k\right)\zeta(1+k)-\sum_{k_1=0}^{\infty}\sum_{k_2=1}^{\infty}\frac{4^{-k_2}\left(-1+3^{k_2}\right)\zeta(1+k_2)}{k_1!}$$

$n!$ is the factorial function

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

Integral representations

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\,\pi+\phi = 1172.35+\phi+\int_0^{\infty}\frac{358.851-2e}{1+t^2}\,dt$$

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\,\pi+\phi = 1172.35+\phi+\int_0^{1}(717.701-4e)\sqrt{1-t^2}\,dt$$

$$17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-0.577216\right)+0.577216\right)\pi\right)-e\pi+\phi=$$
$$1172.35+\phi+\int_0^\infty \frac{(358.851-2e)\sin(t)}{t}\,dt$$

(1/27((17((6+42.6517+20.3103+((32π)/5)+[((((4(1/2(3/2-euler-mascheroni constant)+euler-mascheroni constant)π))))]))-e*Pi+Φ)))^2-euler-mascheroni constant

Input interpretation

$$\left(\frac{1}{27}\left(17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-\gamma\right)+\gamma\right)\pi\right)-e\pi+\Phi\right)\right)^2-\gamma$$

γ is the Euler-Mascheroni constant

Φ is the golden ratio conjugate

Result

4095.96…

4095.96… ≈ 4096 = 64^2

where 4096 and 64 are fundamental values indicated in the Ramanujan paper "**Modular equations and Approximations to π**"

Hence

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

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

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

((17((6+42.6517+20.3103+((32π)/5)+[((((4(1/2(3/2-euler-mascheroni constant)+euler-mascheroni constant)π))))]))-7))^1/15

Input interpretation

$$\sqrt[15]{17\left(6+42.6517+20.3103+\frac{32\pi}{5}+4\left(\frac{1}{2}\left(\frac{3}{2}-\gamma\right)+\gamma\right)\pi\right)-7}$$

γ is the Euler-Mascheroni constant

Result

1.6438174665462117275920164888233444798961618001879383012861972638
...

1.643817466…. ≈ ζ(2) = $\frac{\pi^2}{6}$ = 1.644934 ... (trace of the instanton shape)

Now, we have that:

Theorem 7.1. *The unit ball B is a volume-constrained stable set for* $\mathrm{Per}_s + \beta V_\alpha$ *if and only if* $\beta \in (0, \beta_\star]$.

From:

$$\mathcal{R}^\gamma u(x) := \frac{1}{2^\gamma \pi^{\frac{n-1}{2}}} \frac{\Gamma(\frac{n-1-\gamma}{2})}{\Gamma(\frac{\gamma}{2})} \int_{\partial B} \frac{u(y)}{|x-y|^{n-1-\gamma}} \, d\mathcal{H}^{n-1}_y, \quad x \in \partial B.$$

$\gamma \in (0, n-1)$

For n = 3 and γ = 3/2 = 1.5 , we obtain:

1/(2^1.5*Pi)*gamma(1/2(3-1-1.5))/gamma(1/2*1.5) * Integrate(((1/((x-y)^(3-1-1.5)) u(y))))ℋ^2

Input

$$\frac{1}{2^{1.5}\pi} \times \frac{\Gamma\left(\frac{1}{2}(3-1-1.5)\right)}{\Gamma\left(\frac{1}{2}\times 1.5\right)} \int\left(\frac{1}{(x-y)^{3-1-1.5}} u(y)\right) \mathrm{H}^2 \, dx$$

$\Gamma(x)$ is the gamma function

Result

$0.665936\,\text{Ң}^2\,u(y)\,(x-y)^{0.5}$

The study of this function provides the following representations:

Alternate form

$0.665936\,\text{Ң}^2\,u(y)\,\sqrt{x-y}$

Series expansion of the integral at x=0

$$0.665936\,(-y)^{0.5}\,\text{Ң}^2\,u(y) + \frac{0.332968\,x\,\text{Ң}^2\,u(y)}{(-y)^{0.5}} - \frac{0.083242\,x^2\,(\text{Ң}^2\,u(y))}{(-y)^{1.5}} + \frac{0.041621\,x^3\,\text{Ң}^2\,u(y)}{(-y)^{2.5}} - \frac{0.0260131\,x^4\,(\text{Ң}^2\,u(y))}{(-y)^{3.5}} + O(x^5)$$

(Taylor series)

Indefinite integral assuming all variables are real

$0.443957\,\text{Ң}^2\,u(y)\,(x-y)^{1.5}$ + constant

From:

$$0.665936\,(-y)^{0.5}\,\text{Ң}^2\,u(y) + \frac{0.332968\,x\,\text{Ң}^2\,u(y)}{(-y)^{0.5}} - \frac{0.083242\,x^2\,(\text{Ң}^2\,u(y))}{(-y)^{1.5}} + \frac{0.041621\,x^3\,\text{Ң}^2\,u(y)}{(-y)^{2.5}} - \frac{0.0260131\,x^4\,(\text{Ң}^2\,u(y))}{(-y)^{3.5}} + O(x^5)$$

(Taylor series)

we obtain:

0.665936 (-y)^0.5 Ң^2 u(y) + (0.332968 x Ң^2 u(y))/(-y)^0.5 - (0.083242 x^2 (Ң^2 u(y)))/(-y)^1.5 + (0.041621 x^3 Ң^2 u(y))/(-y)^2.5 - (0.0260131 x^4 (Ң^2 u(y)))/(-y)^3.5 + O(x^5)

Input interpretation

$$0.665936\sqrt{-y}\ \text{H}^2\,u(y)+\frac{0.332968\,x\,\text{H}^2\,u(y)}{\sqrt{-y}}-\frac{0.083242\,x^2\,(\text{H}^2\,u(y))}{(-y)^{1.5}}+\frac{0.041621\,x^3\,\text{H}^2\,u(y)}{(-y)^{2.5}}-\frac{0.0260131\,x^4\,(\text{H}^2\,u(y))}{(-y)^{3.5}}+O(x^5)$$

Result

$$O(x^5)-\frac{0.0260131\,x^4\,\text{H}^2\,u(y)}{(-y)^{3.5}}+\frac{0.041621\,x^3\,\text{H}^2\,u(y)}{(-y)^{2.5}}-\frac{0.083242\,x^2\,\text{H}^2\,u(y)}{(-y)^{1.5}}+\frac{0.332968\,x\,\text{H}^2\,u(y)}{\sqrt{-y}}+0.665936\sqrt{-y}\ \text{H}^2\,u(y)$$

The study of this function provides the following representations:

Alternate forms

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\,O(x^5)-\text{H}^2\,u(y)\,(0.0260131\,x^4+0.041621\,x^3\,y+0.083242\,x^2\,y^2+0.332968\,x\,y^3-0.665936\,y^4)\right)$$

$$O(x^5)+\frac{1}{(-y)^8}\text{H}^2\,u(y)\,(-0.0260131\,x^4\,(-y)^{4.5}+0.041621\,x^3\,(-y)^{5.5}-0.083242\,x^2\,(-y)^{6.5}+0.332968\,x\,(-y)^{7.5}+0.665936\,(-y)^{8.5})$$

$$\frac{1}{(-y)^{7.5}\,y}(y\,(-y)^{7.5}\,O(x^5)-0.0260131\,x^4\,y\,(-y)^4\,\text{H}^2\,u(y)+0.041621\,x^3\,y\,(-y)^5\,\text{H}^2\,u(y)-0.083242\,x^2\,y\,(-y)^6\,\text{H}^2\,u(y)-0.332968\,x\,(-y)^8\,\text{H}^2\,u(y)+0.665936\,y\,(-y)^8\,\text{H}^2\,u(y))$$

Alternate forms assuming x, y, and $\mathfrak{H}$ are positive

$$O(x^5) + \frac{1}{(-y)^8} \text{H}^2 u(y) \left(-\left(1.43351\times 10^{-17} + 0.0260131\, i\right) x^4 y^{4.5} - \left(1.01967\times 10^{-16} + 0.041621\, i\right) x^3 y^{5.5} + \left(8.16074\times 10^{-17} - 0.083242\, i\right) x^2 y^{6.5} - \left(8.97286\times 10^{-16} + 0.332968\, i\right) x\, y^{7.5} + \left(-4.89757\times 10^{-16} + 0.665936\, i\right) y^{8.5}\right)$$

$$O(x^5) + \frac{1}{y^8} (0.665936\, i)\, \text{H}^2 u(y) \left(-\left(0.0390625 + 1.67426\times 10^{-17}\, i\right) x^4 y^{4.5} - \left(0.0625 + 1.91345\times 10^{-17}\, i\right) x^3 y^{5.5} - \left(0.125 + 2.29614\times 10^{-17}\, i\right) x^2 y^{6.5} - 0.5\, x\, y^{7.5} + y^{8.5}\right)$$

$$O(x^5) + \frac{\left(1.11495\times 10^{-17} - 0.0260131\, i\right) x^4\, \text{H}^2 u(y)}{y^{3.5}} + \frac{\left(1.27423\times 10^{-17} - 0.041621\, i\right) x^3\, \text{H}^2 u(y)}{y^{2.5}} + \frac{\left(1.52908\times 10^{-17} - 0.083242\, i\right) x^2\, \text{H}^2 u(y)}{y^{1.5}} - \frac{(0.332968\, i)\, x\, \text{H}^2 u(y)}{\sqrt{y}} + (0.665936\, i) \sqrt{y}\, \text{H}^2 u(y)$$

Series expansion at x=0

$$\left(O(0) + 0.665936\, (-y)^{0.5}\, \text{H}^2 u(y)\right) + \frac{0.332968\, x\, \text{H}^2 u(y)}{(-y)^{0.5}} - \frac{0.083242\, x^2 \left(\text{H}^2 u(y)\right)}{(-y)^{1.5}} + \frac{0.041621\, x^3\, \text{H}^2 u(y)}{(-y)^{2.5}} - \frac{0.0260131\, x^4 \left(\text{H}^2 u(y)\right)}{(-y)^{3.5}} + O(x^5)$$

(Taylor series)

Series expansion at x=∞

$$\left(-\frac{0.0260131\left(\text{Ħ}^2 u(y)\right)x^4}{(-y)^{3.5}}+\frac{0.041621\,\text{Ħ}^2 u(y)\,x^3}{(-y)^{2.5}}-\frac{0.083242\left(\text{Ħ}^2 u(y)\right)x^2}{(-y)^{1.5}}+\frac{0.332968\,\text{Ħ}^2 u(y)\,x}{(-y)^{0.5}}+0.665936\,(-y)^{0.5}\,\text{Ħ}^2 u(y)+O\left(\left(\frac{1}{x}\right)^4\right)\right)+O\left(x^5\right)$$

Derivative

$$\frac{\partial}{\partial x}\left(O\left(x^5\right)-\frac{0.0260131\,x^4\,\text{Ħ}^2 u(y)}{(-y)^{3.5}}+\frac{0.041621\,x^3\,\text{Ħ}^2 u(y)}{(-y)^{2.5}}-\frac{0.083242\,x^2\,\text{Ħ}^2 u(y)}{(-y)^{1.5}}+\frac{0.332968\,x\,\text{Ħ}^2 u(y)}{\sqrt{-y}}+0.665936\sqrt{-y}\;\text{Ħ}^2 u(y)\right)=$$
$$5\,x^4\,O'\left(x^5\right)+\frac{1}{y^8}\text{Ħ}^2 u(y)\left(-0.104052\,x^3\,(-y)^{4.5}+0.124863\,x^2\,(-y)^{5.5}-0.166484\,x\,(-y)^{6.5}+0.332968\,(-y)^{7.5}\right)$$

From the above alternate form

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\,O\left(x^5\right)-\text{Ħ}^2 u(y)\left(0.0260131\,x^4+0.041621\,x^3\,y+0.083242\,x^2\,y^2+0.332968\,x\,y^3-0.665936\,y^4\right)\right)$$

we obtain:

Input interpretation

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\,O\left(x^5\right)-\text{Ħ}^2 u(y)\left(0.0260131\,x^4+0.041621\,x^3\,y+0.083242\,x^2\,y^2+0.332968\,x\,y^3+y^4\times(-0.665936)\right)\right)$$

The study of this function provides the following representations:

Alternate forms

$$O(x^5) + \frac{1}{(-y)^{7/2}} \mathcal{H}^2 u(y) \left(-0.0260131 x^4 - 0.041621 x^3 y - 0.083242 x^2 y^2 - 0.332968 x y^3 + 0.665936 y^4\right)$$

$$\frac{1}{y^4} 0.665936 \left(1.50165 y^4 O(x^5) - 0.0390625 x^4 \sqrt{-y}\, \mathcal{H}^2 u(y) - 0.0625 x^3 \sqrt{-y}\, y \mathcal{H}^2 u(y) - 0.125 x^2 \sqrt{-y}\, y^2 \mathcal{H}^2 u(y) - 0.5 x \sqrt{-y}\, y^3 \mathcal{H}^2 u(y) + \sqrt{-y}\, y^4 \mathcal{H}^2 u(y)\right)$$

Alternate form assuming x, y, and $\mathcal{H}$ are positive

$$O(x^5) - \frac{1}{y^{7/2}} i \mathcal{H}^2 u(y) \left(0.0260131 x^4 + 0.041621 x^3 y + 0.083242 x^2 y^2 + 0.332968 x y^3 - 0.665936 y^4\right)$$

Expanded forms

$$O(x^5) - \frac{0.0260131 x^4 \sqrt{-y}\, \mathcal{H}^2 u(y)}{y^4} - \frac{0.041621 x^3 \sqrt{-y}\, \mathcal{H}^2 u(y)}{y^3} - \frac{0.083242 x^2 \sqrt{-y}\, \mathcal{H}^2 u(y)}{y^2} - \frac{0.332968 x \sqrt{-y}\, \mathcal{H}^2 u(y)}{y} + 0.665936 \sqrt{-y}\, \mathcal{H}^2 u(y)$$

$$O(x^5) - \frac{0.0260131 x^4 \mathcal{H}^2 u(y)}{(-y)^{7/2}} - \frac{0.041621 x^3 y \mathcal{H}^2 u(y)}{(-y)^{7/2}} - \frac{0.083242 x^2 y^2 \mathcal{H}^2 u(y)}{(-y)^{7/2}} - \frac{0.332968 x y^3 \mathcal{H}^2 u(y)}{(-y)^{7/2}} + \frac{0.665936 y^4 \mathcal{H}^2 u(y)}{(-y)^{7/2}}$$

Series expansion at x=0

$$\left(O(0) + 0.665936\sqrt{-y}\ \text{H}^2\, u(y)\right) + \frac{0.332968\, x\, \text{H}^2\, u(y)}{\sqrt{-y}} - \frac{0.083242\, x^2 \left(\text{H}^2\, u(y)\right)}{(-y)^{3/2}} + \frac{0.041621\, x^3\, \text{H}^2\, u(y)}{(-y)^{5/2}} - \frac{0.0260131\, x^4 \left(\text{H}^2\, u(y)\right)}{(-y)^{7/2}} + O\left(x^5\right)$$

(Taylor series)

Series expansion at x=∞

$$\left(-\frac{0.0260131\left(\text{H}^2\, u(y)\right) x^4}{(-y)^{7/2}} + \frac{0.041621\, \text{H}^2\, u(y)\, x^3}{(-y)^{5/2}} - \frac{0.083242\left(\text{H}^2\, u(y)\right) x^2}{(-y)^{3/2}} + \frac{0.332968\, \text{H}^2\, u(y)\, x}{\sqrt{-y}} + 0.665936\sqrt{-y}\ \text{H}^2\, u(y) + O\left(\left(\frac{1}{x}\right)^4\right)\right) + O\left(x^5\right)$$

Derivative

$$\frac{\partial}{\partial x}\left(\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\, O\left(x^5\right) - \text{H}^2\, u(y)\left(0.0260131\, x^4 + 0.041621\, x^3\, y + 0.083242\, x^2\, y^2 + 0.332968\, x\, y^3 - 0.665936\, y^4\right)\right)\right) = 5\, x^4\, O'\left(x^5\right) + \frac{y\, \text{H}^2\, u(y)\left(0.104052\, x^3 + 0.124863\, x^2\, y + 0.166484\, x\, y^2 + 0.332968\, y^3\right)}{(-y)^{9/2}}$$

Now, we have:

Input

$(H_2)^2$

H_n is the n^{th} harmonic number

Exact result

$\frac{9}{4}$

Decimal form

2.25

2.25

From the result:

$0.665936\, H^2\, u(y)\, (x-y)^{0.5}$

for x = 1 and y = 2 , we obtain :

0.665936*2.25*2(1-2)^0.5

Input interpretation

$0.665936 \times 2.25 \times 2 \sqrt{1-2}$

Result

$2.99671\ldots\, i$

Polar coordinates

$r = 2.99671$ (radius), $\theta = 1.5708$ (angle)

2.99671

From the above alternate form:

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\, O(x^5) - H^2\, u(y)\left(0.0260131\, x^4 + 0.041621\, x^3\, y + 0.083242\, x^2\, y^2 + 0.332968\, x\, y^3 - 0.665936\, y^4\right)\right)$$

we have, for x = 1 and y = 2:

1/((-2)^3.5) ((-2)^3.5-2.25*2(0.0260131+0.041621*2+0.083242*2^2+0.332968*2^3-0.665936*2^4))

Input interpretation

$$\frac{1}{(-2)^{3.5}}\left((-2)^{3.5} - 2.25\times 2\left(0.0260131 + 0.041621\times 2 + 0.083242\times 2^2 + 0.332968\times 2^3 + 2^4\times(-0.665936)\right)\right)$$

Result

$1 + 3.00260\ldots\, i$

Polar coordinates

$r = 3.16474$ (radius), $\theta = 1.24931$ (angle)

3.16474

From:

$$\frac{1}{2^{\gamma}\,\pi^{\frac{n-1}{2}}}\,\frac{\Gamma(\frac{n-1-\gamma}{2})}{\Gamma(\frac{\gamma}{2})}\int_{\partial B}\frac{d\mathcal{H}_y^{n-1}}{|x-y|^{n-1-\gamma}} = \mu_0^*(\gamma) \quad \text{for every } x\in\partial B. \qquad (7.15)$$

we obtain:

1/(2^1.5*Pi)*gamma(1/2(3-1-1.5))/gamma(1/2*1.5) * Integrate(((1/((x-y)^(3-1-1.5)))))ℋ^2

Input

$$\frac{1}{2^{1.5}\,\pi}\times\frac{\Gamma\left(\frac{1}{2}(3-1-1.5)\right)}{\Gamma\left(\frac{1}{2}\times 1.5\right)}\int\frac{1}{(x-y)^{3-1-1.5}}\,\text{H}^2\,dx$$

$\Gamma(x)$ is the gamma function

Result

$0.665936\,\text{H}^2\,(x-y)^{0.5}$

The study of this function provides the following representations:

Alternate form

$0.665936\, H^2 \sqrt{x - y}$

Series expansion of the integral at x=0

$$0.665936\,(-y)^{0.5}\,H^2 + \frac{0.332968\,x\,H^2}{(-y)^{0.5}} - \frac{0.083242\,x^2\,H^2}{(-y)^{1.5}} + \frac{0.041621\,x^3\,H^2}{(-y)^{2.5}} - \frac{0.0260131\,x^4\,H^2}{(-y)^{3.5}} + O(x^5)$$

(Taylor series)

Indefinite integral assuming all variables are real

$0.443957\, H^2\,(x - y)^{1.5}$ + constant

From the above expression

$$0.665936\,(-y)^{0.5}\,H^2 + \frac{0.332968\,x\,H^2}{(-y)^{0.5}} - \frac{0.083242\,x^2\,H^2}{(-y)^{1.5}} + \frac{0.041621\,x^3\,H^2}{(-y)^{2.5}} - \frac{0.0260131\,x^4\,H^2}{(-y)^{3.5}} + O(x^5)$$

(Taylor series)

we obtain:

Input interpretation

$$0.665936\sqrt{-y}\;H^2 + \frac{0.332968\,x\,H^2}{\sqrt{-y}} - \frac{0.083242\,x^2\,H^2}{(-y)^{1.5}} + \frac{0.041621\,x^3\,H^2}{(-y)^{2.5}} - \frac{0.0260131\,x^4\,H^2}{(-y)^{3.5}} + O(x^5)$$

Result

$$O(x^5) - \frac{0.0260131\,x^4\,\mathcal{H}^2}{(-y)^{3.5}} + \frac{0.041621\,x^3\,\mathcal{H}^2}{(-y)^{2.5}} - \frac{0.083242\,x^2\,\mathcal{H}^2}{(-y)^{1.5}} + \frac{0.332968\,x\,\mathcal{H}^2}{\sqrt{-y}} + 0.665936\sqrt{-y}\,\mathcal{H}^2$$

The study of this function provides the following representations:

Alternate forms

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\,O(x^5) - \mathcal{H}^2\left(0.0260131\,x^4 + 0.041621\,x^3\,y + 0.083242\,x^2\,y^2 + 0.332968\,x\,y^3 - 0.665936\,y^4\right)\right)$$

$$O(x^5) + \frac{1}{(-y)^8}\mathcal{H}^2\left(-0.0260131\,x^4\,(-y)^{4.5} + 0.041621\,x^3\,(-y)^{5.5} - 0.083242\,x^2\,(-y)^{6.5} + 0.332968\,x\,(-y)^{7.5} + 0.665936\,(-y)^{8.5}\right)$$

$$\frac{1}{(-y)^{7.5}\,y}0.665936\left(1.50165\,y\,(-y)^{7.5}\,O(x^5) - 0.0390625\,x^4\,y\,(-y)^4\,\mathcal{H}^2 + 0.0625\,x^3\,y\,(-y)^5\,\mathcal{H}^2 - 0.125\,x^2\,y\,(-y)^6\,\mathcal{H}^2 - 0.5\,x\,(-y)^8\,\mathcal{H}^2 + y\,(-y)^8\,\mathcal{H}^2\right)$$

Alternate forms assuming x, y, and $\mathcal{H}$ are positive

$$O(x^5) + \frac{1}{(-y)^{8.5}}\mathcal{H}^2\left((0.332968 - 3.26204\times10^{-16}\,i)\,x\,y^8 + 0.0260131\,x^4\,y^5 + 0.041621\,x^3\,y^6 + 0.083242\,x^2\,y^7 - 0.665936\,y^9\right)$$

$$O(x^5) + \frac{1}{y^8} (0.665936\, i)\, \text{H}^2 \left(-(0.0390625 + 1.67426\times 10^{-17}\, i)\, x^4\, y^{4.5} - (0.0625 + 1.91345\times 10^{-17}\, i)\, x^3\, y^{5.5} - (0.125 + 2.29614\times 10^{-17}\, i)\, x^2\, y^{6.5} - 0.5\, x\, y^{7.5} + y^{8.5}\right)$$

$$O(x^5) + \frac{(1.11495\times 10^{-17} - 0.0260131\, i)\, x^4\, \text{H}^2}{y^{3.5}} + \frac{(1.27423\times 10^{-17} - 0.041621\, i)\, x^3\, \text{H}^2}{y^{2.5}} + \frac{(1.52908\times 10^{-17} - 0.083242\, i)\, x^2\, \text{H}^2}{y^{1.5}} - \frac{(0.332968\, i)\, x\, \text{H}^2}{\sqrt{y}} + (0.665936\, i)\, \sqrt{y}\, \text{H}^2$$

Series expansion at x=0

$$\left(O(0) + 0.665936\, (-y)^{0.5}\, \text{H}^2\right) + \frac{0.332968\, x\, \text{H}^2}{(-y)^{0.5}} - \frac{0.083242\, x^2\, \text{H}^2}{(-y)^{1.5}} + \frac{0.041621\, x^3\, \text{H}^2}{(-y)^{2.5}} - \frac{0.0260131\, x^4\, \text{H}^2}{(-y)^{3.5}} + O(x^5)$$

(Taylor series)

Series expansion at x=∞

$$\left(-\frac{0.0260131\, \text{H}^2\, x^4}{(-y)^{3.5}} + \frac{0.041621\, \text{H}^2\, x^3}{(-y)^{2.5}} - \frac{0.083242\, \text{H}^2\, x^2}{(-y)^{1.5}} + \frac{0.332968\, \text{H}^2\, x}{(-y)^{0.5}} + 0.665936\, (-y)^{0.5}\, \text{H}^2 + O\left(\left(\frac{1}{x}\right)^4\right)\right) + O(x^5)$$

Derivative

$$\frac{\partial}{\partial x}\left(O(x^5) - \frac{0.0260131\, x^4\, \text{H}^2}{(-y)^{3.5}} + \frac{0.041621\, x^3\, \text{H}^2}{(-y)^{2.5}} - \frac{0.083242\, x^2\, \text{H}^2}{(-y)^{1.5}} + \frac{0.332968\, x\, \text{H}^2}{\sqrt{-y}} + 0.665936\sqrt{-y}\, \text{H}^2\right) = 5\, x^4\, O'(x^5) + \frac{1}{y^8}\text{H}^2\left(-0.104052\, x^3\, (-y)^{4.5} + 0.124863\, x^2\, (-y)^{5.5} - 0.166484\, x\, (-y)^{6.5} + 0.332968\, (-y)^{7.5}\right)$$

From the previous alternate form:

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\, O(x^5) - \text{H}^2\left(0.0260131\, x^4 + 0.041621\, x^3\, y + 0.083242\, x^2\, y^2 + 0.332968\, x\, y^3 - 0.665936\, y^4\right)\right)$$

we obtain:

Input interpretation

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\, O(x^5) - \text{H}^2\left(0.0260131\, x^4 + 0.041621\, x^3\, y + 0.083242\, x^2\, y^2 + 0.332968\, x\, y^3 + y^4 \times (-0.665936)\right)\right)$$

The study of this function provides the following representations:

Alternate forms

$$O(x^5) + \frac{1}{(-y)^{7/2}}\text{H}^2\left(-0.0260131\, x^4 - 0.041621\, x^3\, y - 0.083242\, x^2\, y^2 - 0.332968\, x\, y^3 + 0.665936\, y^4\right)$$

$$\frac{1}{y^4}0.665936\left(1.50165\,y^4\,O(x^5) - 0.0390625\,x^4\sqrt{-y}\,\mathcal{H}^2 - 0.0625\,x^3\sqrt{-y}\,y\,\mathcal{H}^2 - 0.125\,x^2\sqrt{-y}\,y^2\,\mathcal{H}^2 - 0.5\,x\sqrt{-y}\,y^3\,\mathcal{H}^2 + \sqrt{-y}\,y^4\,\mathcal{H}^2\right)$$

Alternate form assuming x, y, and $\mathcal{H}$ are positive

$$O(x^5) - \frac{1}{y^{7/2}}i\,\mathcal{H}^2\left(0.0260131\,x^4 + 0.041621\,x^3\,y + 0.083242\,x^2\,y^2 + 0.332968\,x\,y^3 - 0.665936\,y^4\right)$$

Expanded forms

$$O(x^5) - \frac{0.0260131\,x^4\sqrt{-y}\,\mathcal{H}^2}{y^4} - \frac{0.041621\,x^3\sqrt{-y}\,\mathcal{H}^2}{y^3} - \frac{0.083242\,x^2\sqrt{-y}\,\mathcal{H}^2}{y^2} - \frac{0.332968\,x\sqrt{-y}\,\mathcal{H}^2}{y} + 0.665936\sqrt{-y}\,\mathcal{H}^2$$

$$O(x^5) - \frac{0.0260131\,x^4\,\mathcal{H}^2}{(-y)^{7/2}} - \frac{0.041621\,x^3\,y\,\mathcal{H}^2}{(-y)^{7/2}} - \frac{0.083242\,x^2\,y^2\,\mathcal{H}^2}{(-y)^{7/2}} - \frac{0.332968\,x\,y^3\,\mathcal{H}^2}{(-y)^{7/2}} + \frac{0.665936\,y^4\,\mathcal{H}^2}{(-y)^{7/2}}$$

Series expansion at x=0

$$\left(O(0) + 0.665936\sqrt{-y}\,\mathcal{H}^2\right) + \frac{0.332968\,x\,\mathcal{H}^2}{\sqrt{-y}} - \frac{0.083242\,x^2\,\mathcal{H}^2}{(-y)^{3/2}} + \frac{0.041621\,x^3\,\mathcal{H}^2}{(-y)^{5/2}} - \frac{0.0260131\,x^4\,\mathcal{H}^2}{(-y)^{7/2}} + O(x^5)$$

(Taylor series)

Series expansion at x=∞

$$\left(-\frac{0.0260131\,\text{H}^2\,x^4}{(-y)^{7/2}}+\frac{0.041621\,\text{H}^2\,x^3}{(-y)^{5/2}}-\frac{0.083242\,\text{H}^2\,x^2}{(-y)^{3/2}}+\frac{0.332968\,\text{H}^2\,x}{\sqrt{-y}}+0.665936\sqrt{-y}\;\text{H}^2+O\left(\left(\frac{1}{x}\right)^4\right)\right)+O(x^5)$$

Derivative

$$\frac{\partial}{\partial x}\left(\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\,O(x^5)-\text{H}^2\left(0.0260131\,x^4+0.041621\,x^3\,y+0.083242\,x^2\,y^2+0.332968\,x\,y^3-0.665936\,y^4\right)\right)\right)=$$
$$5\,x^4\,O'(x^5)+\frac{\text{H}^2\left(-0.104052\,x^3-0.124863\,x^2\,y-0.166484\,x\,y^2-0.332968\,y^3\right)}{(-y)^{7/2}}$$

From the above alternate form:

$$O(x^5)+\frac{1}{(-y)^{7/2}}\text{H}^2\left(-0.0260131\,x^4-0.041621\,x^3\,y-0.083242\,x^2\,y^2-0.332968\,x\,y^3+0.665936\,y^4\right)$$

for x = 1 and y = 2 , we obtain:

1+1/((-2)^3.5) 2.25((0.0260131-0.041621*2-0.083242*2^2-0.332968*2^3+0.665936*2^4))

Input interpretation

$$1+\frac{1}{(-2)^{3.5}}\times 2.25\left(0.0260131-0.041621\times 2-0.083242\times 2^2+2^3\times(-0.332968)+0.665936\times 2^4\right)$$

Result
1 +
1.51165… i

Polar coordinates
$r = 1.81248$ (radius), $\theta = 0.986358$ (angle)
1.81248

From the result

$0.665936\,Ħ^2\,(x-y)^{0.5}$

we obtain:

0.665936*2.25(1-2)^0.5

Input interpretation
$0.665936\times 2.25\sqrt{1-2}$

Result
1.49836… i

Polar coordinates
$r = 1.49836$ (radius), $\theta = 1.5708$ (angle)
1.49836

Dividing the two analyzed expressions, we obtain:

((O(x^5)+(ℌ^2 u(y)(-0.0260131x^4-0.041621x^3y-0.083242x^2y^2-0.332968xy^3+0.665936y^4))/(-y)^(7/2)))/((O(x^5)+(ℌ^2(-0.0260131x^4-0.041621x^3y-0.083242x^2y^2-0.332968xy^3+0.665936y^4))/(-y)^(7/2)))

Input interpretation

$$\frac{O(x^5)+\frac{Ħ^2\,u(y)\left(-0.0260131\,x^4-0.041621\,x^3\,y-0.083242\,x^2\,y^2+x\,y^3\times(-0.332968)+0.665936\,y^4\right)}{(-y)^{7/2}}}{O(x^5)+\frac{Ħ^2\left(-0.0260131\,x^4-0.041621\,x^3\,y-0.083242\,x^2\,y^2+x\,y^3\times(-0.332968)+0.665936\,y^4\right)}{(-y)^{7/2}}}$$

The study of this function provides the following representations:

Alternate forms

$$\frac{38.4422\,(-y)^{7/2}\,O(x^5) - \text{H}^2\,u(y)\left(x^4 + 1.6\,x^3\,y + 3.2\,x^2\,y^2 + 12.8\,x\,y^3 - 25.6\,y^4\right)}{38.4422\,(-y)^{7/2}\,O(x^5) - \text{H}^2\left(x^4 + 1.6\,x^3\,y + 3.2\,x^2\,y^2 + 12.8\,x\,y^3 - 25.6\,y^4\right)}$$

$$\left(1.50165\,y^4\,O(x^5) - 0.0390625\,x^4\sqrt{-y}\,\text{H}^2\,u(y) - 0.0625\,x^3\sqrt{-y}\,y\,\text{H}^2\,u(y) - 0.125\,x^2\sqrt{-y}\,y^2\,\text{H}^2\,u(y) - 0.5\,x\sqrt{-y}\,y^3\,\text{H}^2\,u(y) + \sqrt{-y}\,y^4\,\text{H}^2\,u(y)\right) / \left(1.50165\,y^4\,O(x^5) - 0.0390625\,x^4\sqrt{-y}\,\text{H}^2 - 0.0625\,x^3\sqrt{-y}\,y\,\text{H}^2 - 0.125\,x^2\sqrt{-y}\,y^2\,\text{H}^2 - 0.5\,x\sqrt{-y}\,y^3\,\text{H}^2 + \sqrt{-y}\,y^4\,\text{H}^2\right)$$

Expanded forms

$$
\begin{aligned}
&-\left((0.0260131\, x^4\, \mathrm{H}^2\, u(y)) \Big/ \left((-y)^{7/2} \left(O(x^5) - \frac{0.0260131\, x^4\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \mathrm{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \mathrm{H}^2}{(-y)^{7/2}}\right)\right)\right) - \\
&(0.041621\, x^3\, y\, \mathrm{H}^2\, u(y)) \Big/ \left((-y)^{7/2} \left(O(x^5) - \frac{0.0260131\, x^4\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \mathrm{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \mathrm{H}^2}{(-y)^{7/2}}\right)\right) - (0.083242\, x^2\, y^2\, \mathrm{H}^2\, u(y)) \Big/ \\
&\left((-y)^{7/2} \left(O(x^5) - \frac{0.0260131\, x^4\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \mathrm{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \mathrm{H}^2}{(-y)^{7/2}}\right)\right) - (0.332968\, x\, y^3\, \mathrm{H}^2\, u(y)) \Big/ \\
&\left((-y)^{7/2} \left(O(x^5) - \frac{0.0260131\, x^4\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \mathrm{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \mathrm{H}^2}{(-y)^{7/2}}\right)\right) + \\
&(0.665936\, y^4\, \mathrm{H}^2\, u(y)) \Big/ \left((-y)^{7/2} \left(O(x^5) - \frac{0.0260131\, x^4\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \mathrm{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \mathrm{H}^2}{(-y)^{7/2}}\right)\right) + \\
&O(x^5) \Big/ \left(O(x^5) - \frac{0.0260131\, x^4\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \mathrm{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \mathrm{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \mathrm{H}^2}{(-y)^{7/2}}\right)
\end{aligned}
$$

$$-\left(\left(0.0260131\, x^4 \sqrt{-y}\ \mathcal{H}^2 u(y)\right) \Big/ \left(y^4 \left(O(x^5) + \frac{1}{y^4}\sqrt{-y}\ \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)\right)\right)\right) - \frac{0.041621\, x^3 \sqrt{-y}\ \mathcal{H}^2 u(y)}{y^3 \left(O(x^5) + \frac{\sqrt{-y}\ \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)}{y^4}\right)} - \frac{0.083242\, x^2 \sqrt{-y}\ \mathcal{H}^2 u(y)}{y^2 \left(O(x^5) + \frac{\sqrt{-y}\ \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)}{y^4}\right)} - \frac{0.332968\, x \sqrt{-y}\ \mathcal{H}^2 u(y)}{y \left(O(x^5) + \frac{\sqrt{-y}\ \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)}{y^4}\right)} + \frac{0.665936 \sqrt{-y}\ \mathcal{H}^2 u(y)}{O(x^5) + \frac{\sqrt{-y}\ \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)}{y^4}} + \frac{O(x^5)}{O(x^5) + \frac{\sqrt{-y}\ \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)}{y^4}}$$

Alternate forms assuming x, y, and ℋ are positive

$$\frac{\mathcal{H}^2 u(y) \left(x^4 + 1.6\, x^3 y + 3.2\, x^2 y^2 + 12.8\, x y^3 - 25.6\, y^4\right) + (38.4422\, i)\, y^{7/2} O(x^5)}{\mathcal{H}^2 \left(x^4 + 1.6\, x^3 y + 3.2\, x^2 y^2 + 12.8\, x y^3 - 25.6\, y^4\right) + (38.4422\, i)\, y^{7/2} O(x^5)}$$

$$\left(i\, \mathcal{H}^2 u(y) \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)\right) \Big/ \left(y^{7/2} \left(O(x^5) + \frac{1}{y^{7/2}} i\, \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)\right)\right) + \frac{O(x^5)}{O(x^5) + \frac{i\, \mathcal{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3 y - 0.083242\, x^2 y^2 - 0.332968\, x y^3 + 0.665936\, y^4\right)}{y^{7/2}}}$$

Series expansion at x=0

$$\left(\left(0.665936\sqrt{-y}\ \mathrm{H}^2 u(y)+\frac{0.332968\,\mathrm{H}^2 u(y)\,x}{\sqrt{-y}}-\frac{0.083242\left(\mathrm{H}^2 u(y)\right)x^2}{(-y)^{3/2}}+\frac{0.041621\,\mathrm{H}^2 u(y)\,x^3}{(-y)^{5/2}}-\frac{0.0260131\left(\mathrm{H}^2 u(y)\right)x^4}{(-y)^{7/2}}+O\left(x^6\right)\right)+O\left(x^5\right)\right)\Big/\left(\left(0.665936\sqrt{-y}\ \mathrm{H}^2+\frac{0.332968\,\mathrm{H}^2 x}{\sqrt{-y}}-\frac{0.083242\,\mathrm{H}^2 x^2}{(-y)^{3/2}}+\frac{0.041621\,\mathrm{H}^2 x^3}{(-y)^{5/2}}-\frac{0.0260131\,\mathrm{H}^2 x^4}{(-y)^{7/2}}+O\left(x^6\right)\right)+O\left(x^5\right)\right)$$

Series expansion at x=∞

$$\left(\left(-\frac{0.0260131\left(\mathrm{H}^2 u(y)\right)x^4}{(-y)^{7/2}}+\frac{0.041621\,\mathrm{H}^2 u(y)\,x^3}{(-y)^{5/2}}-\frac{0.083242\left(\mathrm{H}^2 u(y)\right)x^2}{(-y)^{3/2}}+\frac{0.332968\,\mathrm{H}^2 u(y)\,x}{\sqrt{-y}}+0.665936\sqrt{-y}\ \mathrm{H}^2 u(y)+O\left(\left(\frac{1}{x}\right)^6\right)\right)+O\left(x^5\right)\right)\Big/\left(\left(-\frac{0.0260131\,\mathrm{H}^2 x^4}{(-y)^{7/2}}+\frac{0.041621\,\mathrm{H}^2 x^3}{(-y)^{5/2}}-\frac{0.083242\,\mathrm{H}^2 x^2}{(-y)^{3/2}}+\frac{0.332968\,\mathrm{H}^2 x}{\sqrt{-y}}+0.665936\sqrt{-y}\ \mathrm{H}^2+O\left(\left(\frac{1}{x}\right)^6\right)\right)+O\left(x^5\right)\right)$$

Derivative

$$\frac{\partial}{\partial x}\left(\frac{O\left(x^5\right)+\frac{\mathrm{H}^2 u(y)\left(-0.0260131\,x^4-0.041621\,x^3\,y-0.083242\,x^2\,y^2-0.332968\,x\,y^3+0.665936\,y^4\right)}{(-y)^{7/2}}}{O\left(x^5\right)+\frac{\mathrm{H}^2\left(-0.0260131\,x^4-0.041621\,x^3\,y-0.083242\,x^2\,y^2-0.332968\,x\,y^3+0.665936\,y^4\right)}{(-y)^{7/2}}}\right)=$$

$$-\Big(\Big(3.32968\,(-y)^{7/2}\,\mathrm{H}^2\,\Big(x^4\,O'\left(x^5\right)\left(u(y)\left(-0.0390625\,x^4-0.0625\,x^3\,y-0.125\,x^2\,y^2-0.5\,x\,y^3+y^4\right)+0.0390625\,x^4+0.0625\,x^3\,y+0.125\,x^2\,y^2+0.5\,x\,y^3-y^4\right)+O\left(x^5\right)\left(u(y)\left(0.03125\,x^3+0.0375\,x^2\,y+0.05\,x\,y^2+0.1\,y^3\right)-0.03125\,x^3-0.0375\,x^2\,y-0.05\,x\,y^2-0.1\,y^3\right)\Big)\Big)\Big/\Big(y\,(-y)^{5/2}\,O\left(x^5\right)+\mathrm{H}^2\left(0.0260131\,x^4+0.041621\,x^3\,y+0.083242\,x^2\,y^2+0.332968\,x\,y^3-0.665936\,y^4\right)\Big)^2\Big)$$

From:

$$\frac{38.4422 (-y)^{7/2} O(x^5) - Ħ^2 u(y) (x^4 + 1.6 x^3 y + 3.2 x^2 y^2 + 12.8 x y^3 - 25.6 y^4)}{38.4422 (-y)^{7/2} O(x^5) - Ħ^2 (x^4 + 1.6 x^3 y + 3.2 x^2 y^2 + 12.8 x y^3 - 25.6 y^4)}$$

we obtain:

Input interpretation

$$\frac{38.4422 (-y)^{7/2} O(x^5) - Ħ^2 u(y) (x^4 + 1.6 x^3 y + 3.2 x^2 y^2 + 12.8 x y^3 - 25.6 y^4)}{38.4422 (-y)^{7/2} O(x^5) - Ħ^2 (x^4 + 1.6 x^3 y + 3.2 x^2 y^2 + 12.8 x y^3 - 25.6 y^4)}$$

The study of this function provides the following representations:

Alternate forms

$$\frac{192211 (-y)^{7/2} O(x^5) - 1000 Ħ^2 u(y) (5 x^4 + 8 x^3 y + 16 x^2 y^2 + 64 x y^3 - 128 y^4)}{192211 (-y)^{7/2} O(x^5) - 1000 Ħ^2 (5 x^4 + 8 x^3 y + 16 x^2 y^2 + 64 x y^3 - 128 y^4)}$$

$$(38.4422 \sqrt{-y}\ y^3 O(x^5) + x^4 Ħ^2 u(y) + 1.6 x^3 y Ħ^2 u(y) + 3.2 x^2 y^2 Ħ^2 u(y) + 12.8 x y^3 Ħ^2 u(y) - 25.6 y^4 Ħ^2 u(y)) / (38.4422 \sqrt{-y}\ y^3 O(x^5) + x^4 Ħ^2 + 1.6 x^3 y Ħ^2 + 3.2 x^2 y^2 Ħ^2 + 12.8 x y^3 Ħ^2 - 25.6 y^4 Ħ^2)$$

Expanded forms

$$-\left(\left(x^4\, \mathcal{H}^2\, u(y)\right)/\left(38.4422\, (-y)^{7/2}\, O(x^5) + x^4\, (-\mathcal{H}^2) - 1.6\, x^3\, y\, \mathcal{H}^2 - 3.2\, x^2\, y^2\, \mathcal{H}^2 - 12.8\, x\, y^3\, \mathcal{H}^2 + 25.6\, y^4\, \mathcal{H}^2\right)\right) - \left(1.6\, x^3\, y\, \mathcal{H}^2\, u(y)\right)/\left(38.4422\, (-y)^{7/2}\, O(x^5) + x^4\, (-\mathcal{H}^2) - 1.6\, x^3\, y\, \mathcal{H}^2 - 3.2\, x^2\, y^2\, \mathcal{H}^2 - 12.8\, x\, y^3\, \mathcal{H}^2 + 25.6\, y^4\, \mathcal{H}^2\right) - \left(3.2\, x^2\, y^2\, \mathcal{H}^2\, u(y)\right)/\left(38.4422\, (-y)^{7/2}\, O(x^5) + x^4\, (-\mathcal{H}^2) - 1.6\, x^3\, y\, \mathcal{H}^2 - 3.2\, x^2\, y^2\, \mathcal{H}^2 - 12.8\, x\, y^3\, \mathcal{H}^2 + 25.6\, y^4\, \mathcal{H}^2\right) - \left(12.8\, x\, y^3\, \mathcal{H}^2\, u(y)\right)/\left(38.4422\, (-y)^{7/2}\, O(x^5) + x^4\, (-\mathcal{H}^2) - 1.6\, x^3\, y\, \mathcal{H}^2 - 3.2\, x^2\, y^2\, \mathcal{H}^2 - 12.8\, x\, y^3\, \mathcal{H}^2 + 25.6\, y^4\, \mathcal{H}^2\right) + \left(25.6\, y^4\, \mathcal{H}^2\, u(y)\right)/\left(38.4422\, (-y)^{7/2}\, O(x^5) + x^4\, (-\mathcal{H}^2) - 1.6\, x^3\, y\, \mathcal{H}^2 - 3.2\, x^2\, y^2\, \mathcal{H}^2 - 12.8\, x\, y^3\, \mathcal{H}^2 + 25.6\, y^4\, \mathcal{H}^2\right) + \left(38.4422\, (-y)^{7/2}\, O(x^5)\right)/\left(38.4422\, (-y)^{7/2}\, O(x^5) + x^4\, (-\mathcal{H}^2) - 1.6\, x^3\, y\, \mathcal{H}^2 - 3.2\, x^2\, y^2\, \mathcal{H}^2 - 12.8\, x\, y^3\, \mathcal{H}^2 + 25.6\, y^4\, \mathcal{H}^2\right)$$

$$-\frac{x^4\, \mathcal{H}^2\, u(y)}{-38.4422\, \sqrt{-y}\;\; y^3\, O(x^5) - \mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4)} - \frac{1.6\, x^3\, y\, \mathcal{H}^2\, u(y)}{-38.4422\, \sqrt{-y}\;\; y^3\, O(x^5) - \mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4)} - \frac{3.2\, x^2\, y^2\, \mathcal{H}^2\, u(y)}{-38.4422\, \sqrt{-y}\;\; y^3\, O(x^5) - \mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4)} - \frac{12.8\, x\, y^3\, \mathcal{H}^2\, u(y)}{-38.4422\, \sqrt{-y}\;\; y^3\, O(x^5) - \mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4)} + \frac{25.6\, y^4\, \mathcal{H}^2\, u(y)}{-38.4422\, \sqrt{-y}\;\; y^3\, O(x^5) - \mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4)} - \frac{38.4422\, \sqrt{-y}\;\; y^3\, O(x^5)}{-38.4422\, \sqrt{-y}\;\; y^3\, O(x^5) - \mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4)}$$

Alternate forms assuming x, y, and $\mathcal{H}$ are positive

$$\frac{\mathcal{H}^2\, u(y)\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4) + (38.4422\, i)\, y^{7/2}\, O(x^5)}{\mathcal{H}^2\, (x^4 + 1.6\, x^3\, y + 3.2\, x^2\, y^2 + 12.8\, x\, y^3 - 25.6\, y^4) + (38.4422\, i)\, y^{7/2}\, O(x^5)}$$

$$-\frac{\text{Ħ}^2 u(y)\left(x^4+1.6x^3 y+3.2x^2 y^2+12.8x y^3-25.6y^4\right)}{-\text{Ħ}^2\left(x^4+1.6x^3 y+3.2x^2 y^2+12.8x y^3-25.6y^4\right)+(-38.4422\,i)\,y^{7/2}\,O\!\left(x^5\right)}-\frac{(38.4422\,i)\,y^{7/2}\,O\!\left(x^5\right)}{-\text{Ħ}^2\left(x^4+1.6x^3 y+3.2x^2 y^2+12.8x y^3-25.6y^4\right)+(-38.4422\,i)\,y^{7/2}\,O\!\left(x^5\right)}$$

Series expansion at x=0

$$\big((-0.665935\left(y^4\,\text{Ħ}^2\,u(y)\right)+0.332967\,y^3\,\text{Ħ}^2\,u(y)\,x+0.0832419\,y^2\,\text{Ħ}^2\,u(y)\,x^2+0.0416209\,y\,\text{Ħ}^2\,u(y)\,x^3+0.0260131\,\text{Ħ}^2\,u(y)\,x^4+O(x^6))-(-y)^{7/2}\,O(x^5)\big)\big/\big((-0.665935\left(y^4\,\text{Ħ}^2\right)+0.332967\,y^3\,\text{Ħ}^2\,x+0.0832419\,y^2\,\text{Ħ}^2\,x^2+0.0416209\,y\,\text{Ħ}^2\,x^3+0.0260131\,\text{Ħ}^2\,x^4+O(x^6))-(-y)^{7/2}\,O(x^5)\big)$$

Series expansion at x=∞

$$\left(\left(0.0260131\,\text{Ħ}^2\,u(y)\,x^4+0.0416209\,y\,\text{Ħ}^2\,u(y)\,x^3+0.0832419\,y^2\,\text{Ħ}^2\,u(y)\,x^2+0.332967\,y^3\,\text{Ħ}^2\,u(y)\,x-0.665935\left(y^4\,\text{Ħ}^2\,u(y)\right)+O\!\left(\left(\frac{1}{x}\right)^6\right)\right)-(-y)^{7/2}\,O(x^5)\right)\Big/\left(\left(0.0260131\,\text{Ħ}^2\,x^4+0.0416209\,y\,\text{Ħ}^2\,x^3+0.0832419\,y^2\,\text{Ħ}^2\,x^2+0.332967\,y^3\,\text{Ħ}^2\,x-0.665935\left(y^4\,\text{Ħ}^2\right)+O\!\left(\left(\frac{1}{x}\right)^6\right)\right)-(-y)^{7/2}\,O(x^5)\right)$$

Derivative

$$\frac{\partial}{\partial x}\Big(\big(38.4422\,(-y)^{7/2}\,O(x^5)-\text{Ħ}^2\,u(y)\left(x^4+1.6x^3 y+3.2x^2 y^2+12.8x y^3-25.6y^4\right)\big)\big/\big(38.4422\,(-y)^{7/2}\,O(x^5)-\text{Ħ}^2\left(x^4+1.6x^3 y+3.2x^2 y^2+12.8x y^3-25.6y^4\right)\big)\Big)=$$

$$\Big((-y)^{5/2}\,y\,\text{Ħ}^2\,\big(x^4\,O'(x^5)\,\big(u(y)\left(-192.211x^4-307.538x^3 y-615.075x^2 y^2-2460.3x y^3+4920.6y^4\right)+192.211x^4+307.538x^3 y+615.075x^2 y^2+2460.3x y^3-4920.6y^4\big)+O(x^5)\,\big(u(y)\left(153.769x^3+184.523x^2 y+246.03x y^2+492.06y^3\right)-153.769x^3-184.523x^2 y-246.03x y^2-492.06y^3\big)\big)\Big)\Big/\big(38.4422\,(-y)^{7/2}\,O(x^5)-\text{Ħ}^2\left(x^4+1.6x^3 y+3.2x^2 y^2+12.8x y^3-25.6y^4\right)\big)^2$$

Subtracting the two above expressions, we obtain:

(ℋ^2 u(y) (-0.0260131 2^4 - 0.041621 2 - 0.083242 2^2 - 0.332968 2^3 + 0.665936 2^4))/(-2)^(7/2) - (ℋ^2 (-0.0260131 - 0.041621 2 - 0.083242 2^2 - 0.332968 2^3 + 0.665936 2^4))/(-2)^(7/2)

Input interpretation

$$\frac{1}{(-2)^{7/2}} \mathcal{H}^2 u(y) \left(-0.0260131 \times 2^4 - 0.041621 \times 2 - 0.083242 \times 2^2 + 2^3 \times (-0.332968) + 0.665936 \times 2^4\right) - \frac{1}{(-2)^{7/2}} \mathcal{H}^2 \left(-0.0260131 - 0.041621 \times 2 - 0.083242 \times 2^2 + 2^3 \times (-0.332968) + 0.665936 \times 2^4\right)$$

Result

$$(0.632756\, i)\, \mathcal{H}^2 u(y) - (0.667244\, i)\, \mathcal{H}^2$$

The study of this function provides the following representations:

Alternate forms

$$i\, \mathcal{H}^2 (0.632756\, u(y) - 0.667244)$$

$$\mathcal{H}^2 ((0.632756\, i)\, u(y) - 0.667244\, i)$$

$$(0.632756\, i)\, \mathcal{H}^2 ((1 + 0\, i)\, u(y) - (1.05451 + 0\, i))$$

Alternate form assuming y and ℋ are real

$$0 + i \left(0.632756\, \mathcal{H}^2 u(y) - 0.667244\, \mathcal{H}^2 + 0\right)$$

Properties as a real function
Domain

$\emptyset$

Range

$\emptyset$

$\emptyset$ is the set with no elements

Series expansion at y=0

$$((0.632756\,i)\,u(0) - 0.667244\,i)\,H^2 + (0.632756\,i)\,y\,H^2\,u'(0) + (0.316378\,i)\,y^2\,H^2\,u''(0) + (0.105459\,i)\,u^{(3)}(0)\,y^3\,H^2 + (0.0263648\,i)\,u^{(4)}(0)\,y^4\,H^2 + O(y^5)$$

(Taylor series)

Derivative

$$\frac{\partial}{\partial y}\left((0.632756\,i)\,H^2\,u(y) - (0.667244\,i)\,H^2\right) = (0.632756\,i)\,H^2\,u'(y)$$

From:

$(0.632756\,i)\,H^2\,u(y) - (0.667244\,i)\,H^2$

we obtain:

(0.632756 i) (2.25) (2) - (0.667244 i) (2.25)

Input interpretation

$(0.632756\,i)\times 2.25\times 2 - (0.667244\,i)\times 2.25$

i is the imaginary unit

Result

$1.34610\ldots\,i$

Polar coordinates

$r = 1.3461$ (radius), $\theta = 1.5708$ (angle)

1.3461

Considering only the result of the second integral, we obtain also:

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\, O(x^5) - \mathcal{H}^2 \,(0.0260131\, x^4 + 0.041621\, x^3\, y + 0.083242\, x^2\, y^2 + 0.332968\, x\, y^3 - 0.665936\, y^4)\right)$$

((O(x^5)+(ℌ^2(-0.0260131x^4-0.041621x^3y-0.083242x^2y^2-0.332968xy^3+0.665936y^4))/(-y)^(7/2)))

Input interpretation

$$O(x^5) + \frac{1}{(-y)^{7/2}}\mathcal{H}^2 \,(-0.0260131\, x^4 - 0.041621\, x^3\, y - 0.083242\, x^2\, y^2 + x\, y^3 \times (-0.332968) + 0.665936\, y^4)$$

Result

$$O(x^5) + \frac{1}{(-y)^{7/2}}\mathcal{H}^2 \,(-0.0260131\, x^4 - 0.041621\, x^3\, y - 0.083242\, x^2\, y^2 - 0.332968\, x\, y^3 + 0.665936\, y^4)$$

The study of this function provides the following representations:

Alternate forms

$$\frac{1}{(-y)^{7/2}}\left((-y)^{7/2}\, O(x^5) - \mathcal{H}^2 \,(0.0260131\, x^4 + 0.041621\, x^3\, y + 0.083242\, x^2\, y^2 + 0.332968\, x\, y^3 - 0.665936\, y^4)\right)$$

$$O(x^5) + \text{H}^2 \left(-\frac{0.0260131\, x^4}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3}{(-y)^{7/2}} + \frac{0.665936\, y^4}{(-y)^{7/2}} \right)$$

$$\frac{1}{y^4} 0.665936 \left(1.50165\, y^4\, O(x^5) - 0.0390625\, x^4 \sqrt{-y}\ \text{H}^2 - 0.0625\, x^3 \sqrt{-y}\ y\, \text{H}^2 - 0.125\, x^2 \sqrt{-y}\ y^2\, \text{H}^2 - 0.5\, x \sqrt{-y}\ y^3\, \text{H}^2 + \sqrt{-y}\ y^4\, \text{H}^2\right)$$

Alternate form assuming x, y, and $\mathfrak{H}$ are positive

$$O(x^5) + \frac{1}{y^{7/2}} i\, \text{H}^2 \left(-0.0260131\, x^4 - 0.041621\, x^3\, y - 0.083242\, x^2\, y^2 - 0.332968\, x\, y^3 + 0.665936\, y^4\right)$$

Expanded forms

$$O(x^5) - \frac{0.0260131\, x^4 \sqrt{-y}\ \text{H}^2}{y^4} - \frac{0.041621\, x^3 \sqrt{-y}\ \text{H}^2}{y^3} - \frac{0.083242\, x^2 \sqrt{-y}\ \text{H}^2}{y^2} - \frac{0.332968\, x \sqrt{-y}\ \text{H}^2}{y} + 0.665936 \sqrt{-y}\ \text{H}^2$$

$$O(x^5) - \frac{0.0260131\, x^4\, \text{H}^2}{(-y)^{7/2}} - \frac{0.041621\, x^3\, y\, \text{H}^2}{(-y)^{7/2}} - \frac{0.083242\, x^2\, y^2\, \text{H}^2}{(-y)^{7/2}} - \frac{0.332968\, x\, y^3\, \text{H}^2}{(-y)^{7/2}} + \frac{0.665936\, y^4\, \text{H}^2}{(-y)^{7/2}}$$

Series expansion at x=0

$$\left(O(0) + 0.665936 \sqrt{-y}\ \text{H}^2\right) + \frac{0.332968\, x\, \text{H}^2}{\sqrt{-y}} - \frac{0.083242\, x^2\, \text{H}^2}{(-y)^{3/2}} + \frac{0.041621\, x^3\, \text{H}^2}{(-y)^{5/2}} - \frac{0.0260131\, x^4\, \text{H}^2}{(-y)^{7/2}} + O(x^5)$$

(Taylor series)

Series expansion at x=∞

$$\left(-\frac{0.0260131\,\text{H}^2 x^4}{(-y)^{7/2}} + \frac{0.041621\,\text{H}^2 x^3}{(-y)^{5/2}} - \frac{0.083242\,\text{H}^2 x^2}{(-y)^{3/2}} + \frac{0.332968\,\text{H}^2 x}{\sqrt{-y}} + 0.665936\sqrt{-y}\;\text{H}^2 + O\left(\left(\frac{1}{x}\right)^4\right)\right) + O(x^5)$$

Derivative

$$\frac{\partial}{\partial x}\left(O(x^5) + \frac{1}{(-y)^{7/2}}\text{H}^2\left(-0.0260131\,x^4 - 0.041621\,x^3\,y - 0.083242\,x^2\,y^2 - 0.332968\,x\,y^3 + 0.665936\,y^4\right)\right) =$$
$$5\,x^4\,O'(x^5) + \frac{\text{H}^2\left(-0.104052\,x^3 - 0.124863\,x^2\,y - 0.166484\,x\,y^2 - 0.332968\,y^3\right)}{(-y)^{7/2}}$$

From the previous result:

$$O(x^5) + \frac{1}{(-y)^{7/2}}\text{H}^2\left(-0.0260131\,x^4 - 0.041621\,x^3\,y - 0.083242\,x^2\,y^2 - 0.332968\,x\,y^3 + 0.665936\,y^4\right)$$

we obtain, for x = 1 and y =2 :

Input interpretation

$$O(1^5) + \frac{1}{(-2)^{7/2}}\text{H}^2\left(-0.0260131\times 2^4 - 0.041621\times 2 - 0.083242\times 2^2 + 2^3\times(-0.332968) + 0.665936\times 2^4\right)$$

Result

$$O(1) + (0.632756\,i)\,\text{H}^2$$

The study of this function provides the following representations:

Alternate forms

$$O(1) + (0.632756 i) \text{H}^2$$

$$(0.632756 + 0 i)\left((1.58039 + 0 i) O(1) + i \text{H}^2\right)$$

$$(1 + 0 i) O(1) + (0.632756 i) \text{H}^2$$

Alternate form assuming $\mathfrak{H}$ is real

$$O(1) + i\left(0.632756 \text{H}^2 + 0\right) + 0$$

Complex roots

$$\text{H} = -(1.25714 i) \sqrt[4]{\text{Re}(O(1))^2} \sin\left(\frac{1}{2} \tan^{-1}(\text{Re}((1.58039 i) O(1)), \text{Im}((1.58039 i) O(1)))\right) - 1.25714 \sqrt[4]{\text{Re}(O(1))^2} \cos\left(\frac{1}{2} \tan^{-1}(\text{Re}((1.58039 i) O(1)), \text{Im}((1.58039 i) O(1)))\right)$$

$$\text{H} = (1.25714 i) \sqrt[4]{\text{Re}(O(1))^2} \sin\left(\frac{1}{2} \tan^{-1}(\text{Re}((1.58039 i) O(1)), \text{Im}((1.58039 i) O(1)))\right) + 1.25714 \sqrt[4]{\text{Re}(O(1))^2} \cos\left(\frac{1}{2} \tan^{-1}(\text{Re}((1.58039 i) O(1)), \text{Im}((1.58039 i) O(1)))\right)$$

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

$\text{Im}(z)$ is the imaginary part of z

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

Polynomial discriminant

$\Delta_{H} = (-2.53102\, i)\, O(1)$

Property as a function
Parity

even

Derivative

$$\frac{d}{dH}\left(O(1) + (0.632756\, i)\, H^2\right) = (1.26551\, i)\, H$$

Indefinite integral

$$\int \left((0.632756\, i)\, H^2 + O(1)\right) dH = O(1)\, H + (0.210919\, i)\, H^3 + \text{constant}$$

From:

(0.632756 i) ℌ^2 + O(1)

we obtain:

(0.632756 i) (2.25) + 1

Input interpretation

$(0.632756\, i) \times 2.25 + 1$

i is the imaginary unit

Result

$1 + 1.42370\ldots\, i$

Polar coordinates

$r = 1.73981$ (radius), $\theta = 0.958465$ (angle)

1.73981

From the division:

$$\frac{38.4422\,(-y)^{7/2}\,O(x^5) - \text{H}^2\,u(y)\,(x^4 + 1.6\,x^3\,y + 3.2\,x^2\,y^2 + 12.8\,x\,y^3 - 25.6\,y^4)}{38.4422\,(-y)^{7/2}\,O(x^5) - \text{H}^2\,(x^4 + 1.6\,x^3\,y + 3.2\,x^2\,y^2 + 12.8\,x\,y^3 - 25.6\,y^4)}$$

we obtain, for x = 1 and y = 2:

(38.4422 (-2)^(7/2) - (2.25)(2) (1 + 1.6 2 + 3.2 2^2 + 12.8 2^3 - 25.6 2^4))/(38.4422 (-2)^(7/2) - (2.25) (1 + 1.6 2 + 3.2 2^2 + 12.8 2^3 - 25.6 2^4))

Input interpretation

$$\frac{38.4422\,(-2)^{7/2} - (2.25\times 2)\,(1 + 1.6\times 2 + 3.2\times 2^2 + 12.8\times 2^3 - 25.6\times 2^4)}{38.4422\,(-2)^{7/2} - 2.25\,(1 + 1.6\times 2 + 3.2\times 2^2 + 12.8\times 2^3 - 25.6\times 2^4)}$$

Result

1.69268... +
0.461385... i

Polar coordinates

$r = 1.75443$ (radius), $\theta = 0.266112$ (angle)

1.75443

From:

$$(0.632756\,i)\,\text{H}^2\,u(y) - (0.667244\,i)\,\text{H}^2$$

and

$$\frac{38.4422\,(-2)^{7/2} - (2.25\times 2)\,(1 + 1.6\times 2 + 3.2\times 2^2 + 12.8\times 2^3 - 25.6\times 2^4)}{38.4422\,(-2)^{7/2} - 2.25\,(1 + 1.6\times 2 + 3.2\times 2^2 + 12.8\times 2^3 - 25.6\times 2^4)}$$

we obtain, after some calculations:

1/(1/4(((38.4422 (-2)^(7/2) - (2.25)(2) (1+1.6*2+3.2*4+12.8*8 - 25.6*16))/(38.4422 (-2)^(7/2) - (2.25) (1 + 1.6*2 + 3.2*4 + 12.8*8 - 25.6*16))+(((0.632756 i) (2.25) (2) - (0.667244 i) (2.25)))))

Input interpretation

$$1\Big/\left(\frac{1}{4}\left(\frac{38.4422\,(-2)^{7/2}-(2.25\times 2)\,(1+1.6\times 2+3.2\times 4+12.8\times 8-25.6\times 16)}{38.4422\,(-2)^{7/2}-2.25\,(1+1.6\times 2+3.2\times 4+12.8\times 8-25.6\times 16)}+((0.632756\,i)\times 2.25\times 2-(0.667244\,i)\times 2.25)\right)\right)$$

i is the imaginary unit

Result

$1.10413\ldots - 1.17902\ldots\, i$

Polar coordinates

$r = 1.6153$ (radius), $\theta = -0.818188$ (angle)

1.6153 result that is a very good approximation to the value of the golden ratio 1.618033988749...

From the two already analyzed expressions:

(0.632756 i) (2.25) (2) - (0.667244 i) (2.25)

Input interpretation

$(0.632756\,i)\times 2.25\times 2-(0.667244\,i)\times 2.25$

i is the imaginary unit

Result

$1.34610\ldots\, i$

Polar coordinates

$r = 1.3461$ (radius), $\theta = 1.5708$ (angle)

1.3461

And:

(0.632756 i) $\mathfrak{H}$^2 + O(1)

(0.632756 i) (2.25) + 1

Input interpretation

$(0.632756\,i)\times 2.25+1$

i is the imaginary unit

Result

$1+$
$1.42370\ldots\,i$

Polar coordinates

$r=1.73981$ (radius), $\theta=0.958465$ (angle)

1.73981

after some calculations, we obtain:

((2((((1/(2Pi)(((0.632756 i) (2.25) + 1 + ((0.632756 i) (2.25) (2) - (0.667244 i) (2.25))))^2))))))^(1/(0.5683000031+0.5269391135+0.9568666373))))

where 0.5683000031, 0.5269391135 and 0.9568666373 are the values of the following Rogers-Ramanujan continued fractions:

$$4\int_0^\infty \frac{t\,dt}{e^{\sqrt{5}t}\cosh t}=\cfrac{1}{1+\cfrac{1^2}{1+\cfrac{1^2}{1+\cfrac{2^2}{1+\cfrac{2^2}{1+\cfrac{3^2}{1+\cfrac{3^2}{1+\ldots}}}}}}}\approx 0.5683000031$$

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

and

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

Input interpretation

$$\left(2\left(\frac{1}{2\pi}\left((0.632756\,i)\times 2.25+1+((0.632756\,i)\times 2.25\times 2-(0.667244\,i)\times 2.25))^2\right)\right)\hat{}\left(\frac{1}{0.5683000031+0.5269391135+0.9568666373}\right)$$

i is the imaginary unit

Result

0.604644… +
1.52462… i

Polar coordinates

$r = 1.64014$ (radius), $\theta = 1.19324$ (angle)

$1.64014 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ... (trace of the instanton shape)

From:

$$\mathscr{R}_\alpha u(x) := 2\int_{\partial B} \frac{u(x)-u(y)}{|x-y|^{n-\alpha}}\, d\mathcal{H}_y^{n-1}, \quad u \in C^1(\partial B),$$

For x = 1 , y = 2, u = 8+4i , n = 3 ; α = 2 , and considering always:

Input

$(H_2)^2$

H_n is the n^{th} harmonic number

Exact result

$\frac{9}{4}$

Decimal form

2.25

2.25

From

$$\mathscr{R}_\alpha u(x) := 2\int_{\partial B} \frac{u(x)-u(y)}{|x-y|^{n-\alpha}}\, d\mathcal{H}_y^{n-1}, \quad u \in C^1(\partial B),$$

we obtain:

2* integrate(((1/(x-y)*((8+4i)x-(8+4i)y))))ℋ^2

Indefinite integral

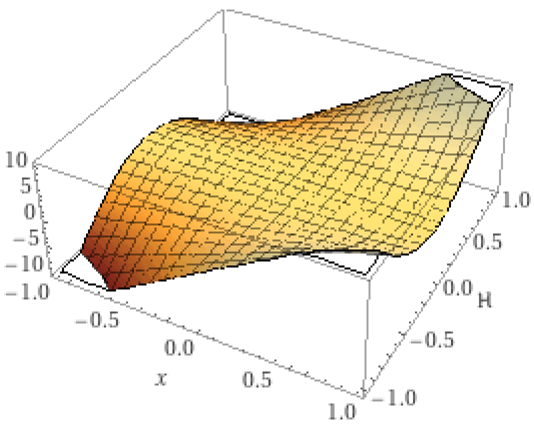
$$2\int \frac{((8+4i)x-(8+4i)y)\,\text{H}^2}{x-y}\,dx = (16+8i)\,x\,\text{H}^2 + \text{constant}$$

i is the imaginary unit

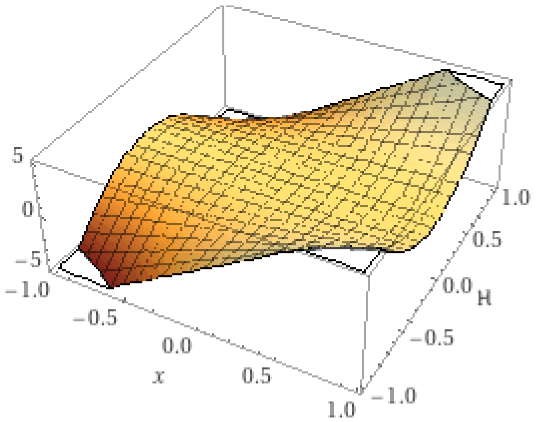
The study of this function provides the following representations:

3D plots

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

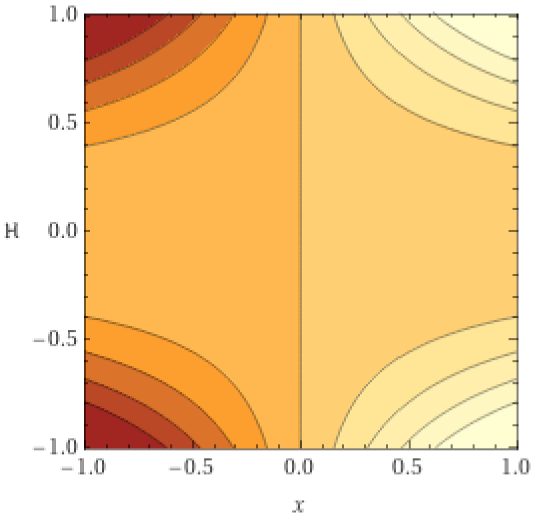


Imaginary part

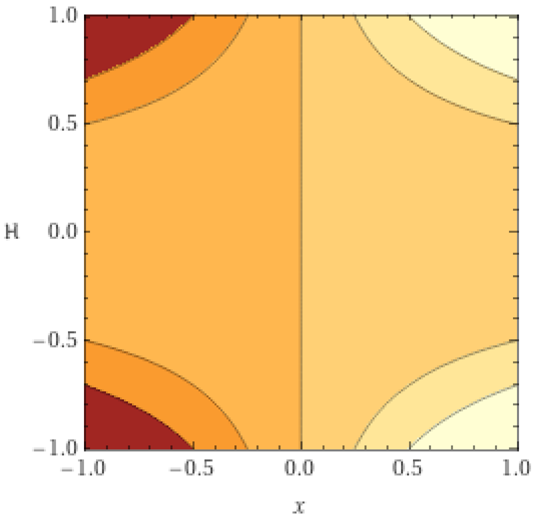


Contour plots

Real part



Imaginary part



(16 + 8 i) (2.25)

Input

$(16+8\,i)\times 2.25$

i is the imaginary unit

Result

$36.+18.\,i$

Polar coordinates

$r = 40.2492$ (radius), $\theta = 0.463648$ (angle)

40.2492

From:

$$[u]^2_{\frac{1-\alpha}{2}} = \iint_{\partial B\times\partial B} \frac{|u(x)-u(y)|^2}{|x-y|^{n-\alpha}}\, d\mathcal{H}^{n-1}_x \mathcal{H}^{n-1}_y = \int_{\partial B} u\,\mathscr{R}_\alpha u\, d\mathcal{H}^{n-1}. \qquad (7.16)$$

If $\alpha \in (1,n)$ then $\gamma = \alpha - 1 \in (0, n-1)$, and thus we can deduce from (7.15) and (7.16) that

we obtain:

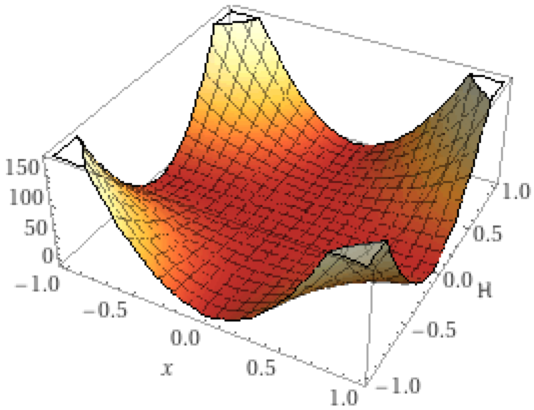
Integrate((((8+4i)*((16 + 8 i)*x (2.25))*(8+4i)))) ℋ^2

Indefinite integral

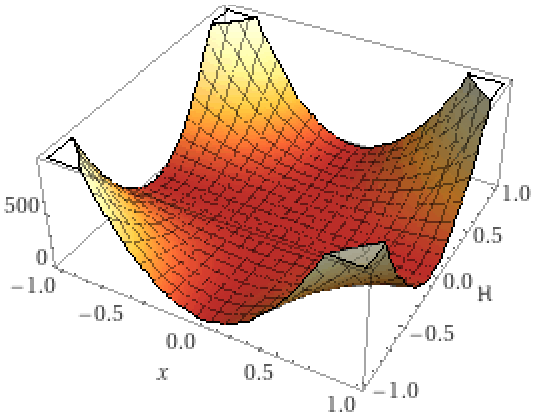
$$\int ((8+4i)((16+8i)\,x\,2.25)(8+4i))\,\text{Ħ}^2\,dx = (288+1584i)\,x^2\,\text{Ħ}^2 + \text{constant}$$

The study of this function provides the following representations:

3D plots
Real part **(figures that can be related to a D-branes/Instantons)**

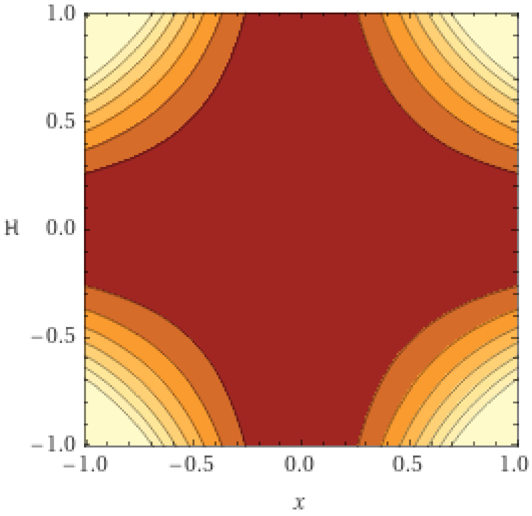


Imaginary part

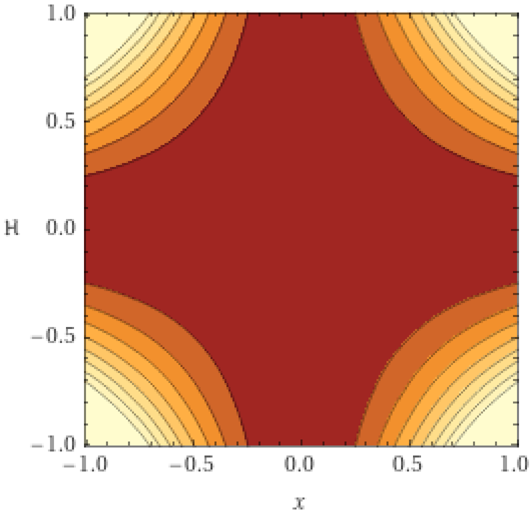


Contour plots

Real part



Imaginary part



Alternate form assuming x and ℋ are real

$288\,x^2\,H^2 + i\left(1584\,x^2\,H^2 + 0\right) + 0$ + constant

(288 + 1584 i) (2.25)

Input

$(288 + 1584\,i) \times 2.25$

i is the imaginary unit

Result

$6.48\ldots \times 10^2 +$
$3.564\ldots \times 10^3\, i$

Polar coordinates

$r = 3622.43$ (radius), $\theta = 1.39094$ (angle)

3622.43

From the two previous expressions, after some calculations, we obtain:

(1/2((288 + 1584 i) (2.25)) - (1/2((16 + 8 i) (2.25)))i)-64i-Pi*i

Input

$$\left(\frac{1}{2}\left(\left(288 + 1584\, i\right) \times 2.25\right) - \left(\frac{1}{2}\left(\left(16 + 8\, i\right) \times 2.25\right)\right) i\right) - 64\, i - \pi\, i$$

i is the imaginary unit

Result

$333 +$
$1696.86\ldots\, i$

Polar coordinates

$r = 1729.22$ (radius), $\theta = 1.37701$ (angle)

1729.22

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)

Polar forms

$1729.22 (\cos(1.37701) + i \sin(1.37701))$

$1729.22 e^{1.37701 i}$

The study of this function provides the following representations:

Alternative representations

$$\left(\frac{1}{2} (288 + 1584 i) 2.25 - \frac{1}{2} i ((16 + 8 i) 2.25)\right) - i 64 - i \pi = -64 i - 180 ° i - 1.125 i (16 + 8 i) + 1.125 (288 + 1584 i)$$

$$\left(\frac{1}{2} (288 + 1584 i) 2.25 - \frac{1}{2} i ((16 + 8 i) 2.25)\right) - i 64 - i \pi = -64 i - 1.125 i (16 + 8 i) + 1.125 (288 + 1584 i) + i^2 \log(-1)$$

$$\left(\frac{1}{2} (288 + 1584 i) 2.25 - \frac{1}{2} i ((16 + 8 i) 2.25)\right) - i 64 - i \pi = -64 i - 1.125 i (16 + 8 i) + 1.125 (288 + 1584 i) - i \cos^{-1}(-1)$$

Series representations

$$\left(\frac{1}{2} (288 + 1584 i) 2.25 - \frac{1}{2} i ((16 + 8 i) 2.25)\right) - i 64 - i \pi = 324 + 1700 i - 9 i^2 - 4 i \sum_{k=0}^{\infty} \frac{(-1)^k}{1 + 2 k}$$

$$\left(\frac{1}{2}(288+1584 i) 2.25-\frac{1}{2} i((16+8 i) 2.25)\right)-i 64-i \pi = 324+1702 i-9 i^2-2 i \sum_{k=1}^{\infty} \frac{2^k}{\binom{2k}{k}}$$

$$\left(\frac{1}{2}(288+1584 i) 2.25-\frac{1}{2} i((16+8 i) 2.25)\right)-i 64-i \pi = 324+1700 i-9 i^2-i \sum_{k=0}^{\infty} \frac{2^{-k}(-6+50 k)}{\binom{3k}{k}}$$

Integral representations

$$\left(\frac{1}{2}(288+1584 i) 2.25-\frac{1}{2} i((16+8 i) 2.25)\right)-i 64-i \pi = 324+1700 i-9 i^2-2 i \int_0^{\infty} \frac{1}{1+t^2} d t$$

$$\left(\frac{1}{2}(288+1584 i) 2.25-\frac{1}{2} i((16+8 i) 2.25)\right)-i 64-i \pi = 324+1700 i-9 i^2-4 i \int_0^1 \sqrt{1-t^2}\, d t$$

$$\left(\frac{1}{2}(288+1584 i) 2.25-\frac{1}{2} i((16+8 i) 2.25)\right)-i 64-i \pi = 324+1700 i-9 i^2-2 i \int_0^{\infty} \frac{\sin (t)}{t} d t$$

From:

$$\mathscr{R}_\alpha = 2^\alpha \pi^{\frac{n-1}{2}} \frac{\Gamma(\frac{\alpha-1}{2})}{\Gamma(\frac{n-\alpha}{2})} \left(\mu_0^*(\alpha-1)\mathrm{Id} - \mathcal{R}^{\alpha-1}\right), \quad \alpha \in (1, n).$$

for:

$\mathcal{R}$ = (16 + 8 i) (2.25)

Input

$(16 + 8\,i) \times 2.25$

i is the imaginary unit

Result

$36. + 18.\,i$

Polar coordinates

$r = 40.2492$ (radius), $\theta = 0.463648$ (angle)

40.2492

μ = 0.665936*2.25(1-2)^0.5

Input interpretation

$0.665936 \times 2.25\sqrt{1-2}$

Result

$1.49836\ldots\, i$

Polar coordinates

$r = 1.49836$ (radius), $\theta = 1.5708$ (angle)

1.49836

and for: x = 1 , y = 2, u = 8+4i , n = 3 ; α = 2 , we obtain:

2^2*Pi*gamma(1/2)/gamma(1/2) (((2*((0.665936*2.25(1-2)^0.5))-((((16 + 8 i) (2.25))^2)))))

Input interpretation

$$2^2\,\pi\times\frac{\Gamma\left(\frac{1}{2}\right)}{\Gamma\left(\frac{1}{2}\right)}\left(2\left(0.665936\times 2.25\sqrt{1-2}\right)-\left((16+8\,i)\times 2.25\right)^2\right)$$

$\Gamma(x)$ is the gamma function

i is the imaginary unit

Result

$-12214.5\ldots-16248.4\ldots\,i$

Polar coordinates

$r = 20327.4$ (radius), $\theta = -2.21541$ (angle)

20327.4

The study of this function provides the following representations:

Polar forms

$$20327.4\,(\cos(-2.21541)+i\sin(-2.21541))$$

$$20327.4\,e^{-2.21541\,i}$$

Alternative representations

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-\left((16+8\,i)\,2.25\right)^2\right)}{\Gamma\left(\frac{1}{2}\right)}=\frac{4\,\pi\left(-\frac{1}{2}\right)!\left(2.99671\sqrt{-1}-(2.25\,(16+8\,i))^2\right)}{\left(-\frac{1}{2}\right)!}$$

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)}=$$
$$\frac{4\,\pi\,\Gamma\left(\frac{1}{2},0\right)\left(2.99671\sqrt{-1}\,-(2.25\,(16+8\,i))^2\right)}{\Gamma\left(\frac{1}{2},0\right)}$$

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)}=$$
$$\frac{4\,\pi\,e^{-\log G(1/2)+\log G(3/2)}\left(2.99671\sqrt{-1}\,-(2.25\,(16+8\,i))^2\right)}{e^{-\log G(1/2)+\log G(3/2)}}$$

Series representations

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)}=$$
$$-5184\left((4-0.00924911\,i)+4\,i+i^2\right)\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2\,k}$$

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)}=$$
$$-2592\left((4-0.00924911\,i)+4\,i+i^2\right)\left(-1+\sum_{k=1}^{\infty}\frac{2^k}{\binom{2\,k}{k}}\right)$$

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)}=$$
$$-1296\left((4-0.00924911\,i)+4\,i+i^2\right)\sum_{k=0}^{\infty}\frac{2^{-k}\,(-6+50\,k)}{\binom{3\,k}{k}}$$

Integral representations

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)} = -2592\left((4-0.00924911\,i)+4\,i+i^2\right)\int_0^\infty \frac{1}{1+t^2}\,dt$$

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)} = -5184\left((4-0.00924911\,i)+4\,i+i^2\right)\int_0^1 \sqrt{1-t^2}\,dt$$

$$\frac{2^2\,\Gamma\left(\frac{1}{2}\right)\pi\left(2\times 0.665936\left(2.25\sqrt{1-2}\right)-((16+8\,i)\,2.25)^2\right)}{\Gamma\left(\frac{1}{2}\right)} = -2592\left((4-0.00924911\,i)+4\,i+i^2\right)\int_0^\infty \frac{\sin(t)}{t}\,dt$$

From which, we obtain, after some calculations:

(((2^2*Pi*gamma(1/2)/gamma(1/2) (((2*((0.665936*2.25(1-2)^0.5))-((((16 + 8 i) (2.25))^2))))))))^1/20

Input interpretation

$$\sqrt[20]{2^2\,\pi\times\frac{\Gamma\left(\frac{1}{2}\right)}{\Gamma\left(\frac{1}{2}\right)}\left(2\left(0.665936\times 2.25\sqrt{1-2}\right)-((16+8\,i)\times 2.25)^2\right)}$$

$\Gamma(x)$ is the gamma function

i is the imaginary unit

Result

1.632053… −
0.1815263… i

Polar coordinates

$r = 1.64212$ (radius), $\theta = -0.11077$ (angle)

$1.64212 \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ... (trace of the instanton shape)

From:

AdS cycles in eternally inflating background

Zhi-Guo Liu and Yun-Song Piao - arXiv:1404.5748v1 [hep-th] 23 Apr 2014

We have that:

We have showed that the bubble universe going through AdS cycles will fragment at certain time t_{Frag} within the 2^{th} or 3^{th}. We will see what is the resulting scenario.

The average square of the amplitude of field fluctuations at t_{Frag} is

$$\begin{aligned} < \delta\varphi_k^2 > &= \frac{1}{(2\pi)^3} \int |\delta\varphi_k|^2 \, d^3k \\ &\simeq \frac{1}{(2\pi)^3} \int_{aH/e}^{aH} 3M_P^2 \left(1 - \frac{\frac{H}{a}\int^t a\mathcal{R}_k \epsilon_{Mat}\, dt'}{\mathcal{R}_k}\right)^2 |\mathcal{R}_k|^2 \, d^3k \\ &= 3M_P^2/4. \end{aligned} \tag{26}$$

We consider:

$M_p = \sqrt{\frac{c\hbar}{8\pi G}} = 2.4 \times 10^{18} GeV$.

$= 4.341 \times 10^{-9}$ kg $= 2.435 \times 10^{18}$ GeV/c^2.

From the result of the above integral, we obtain:

1/4(3(2.435*10^18)^2)

Input interpretation

$$\frac{1}{4}\left(3\left(2.435\times 10^{18}\right)^2\right)$$

Result

4 446 918 750 000 000 000 000 000 000 000 000 000

Scientific notation

4.44691875×10^{36}

$4.44691875*10^{36}$

From which:

ln((((3*(2.435*10^18)^2))/4))+18

Input interpretation

$$\log\left(\frac{1}{4}\left(3\left(2.435\times 10^{18}\right)^2\right)\right)+18$$

$\log(x)$ is the natural logarithm

Result

102.385274788402969924…

102.385274…..

For:

$$H_{Kin}\sim M_P, \qquad H_{Kin}\sim H_*,$$

$M_P = 2.435 * 10^{18}$ GeV and $H = 2.301 * 10^{-18}$

From:

$$\mathcal{P}_{\mathcal{R}}^{1/2}=\frac{k^{3/2}}{\sqrt{2\pi^2}}|\mathcal{R}_k|\sim\frac{H_{Kin}}{\sqrt{\epsilon_{Mat}}M_P},$$

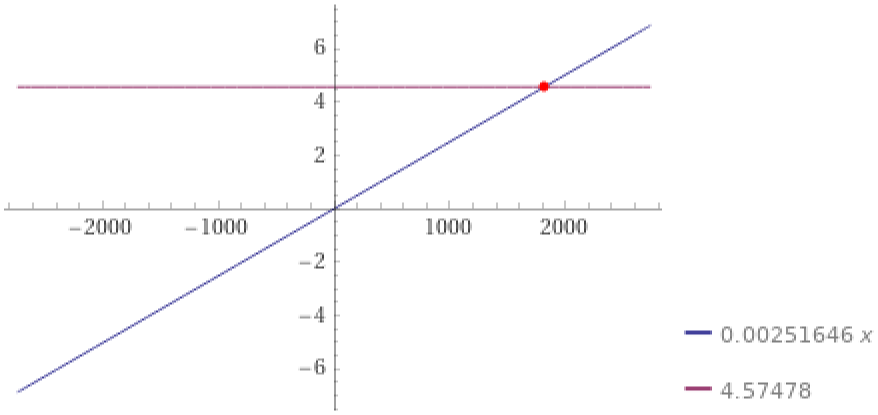
we obtain:

(0.050^(1.5))/(sqrt(2Pi^2))* x = (2.301*10^-18)/(sqrt(3/2))* (2.435 × 10^18)

Input interpretation

$$\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\,x = \frac{2.301\times 10^{-18}}{\sqrt{\frac{3}{2}}}\times 2.435\times 10^{18}$$

Plot



Alternate form

$0.00251646\,x - 4.57478 = 0$

Alternate form assuming x is real

$0.00251646\,x + 0 = 4.57478$

Solution

$x \approx 1817.94$

1817.94

Thence:

(0.050^(1.5))/(sqrt(2Pi^2))* 1817.94

Input interpretation

$$\frac{0.05^{1.5}}{\sqrt{2\pi^2}} \times 1817.94$$

Result

4.574774392661558023687973807385223038662467678027563434807754474 ...

4.574774392….

The study of this function provides the following representations:

Series representations

$$\frac{1817.94 \times 0.05^{1.5}}{\sqrt{2\pi^2}} = \frac{20.3252}{\sqrt{-1+2\pi^2}\sum_{k=0}^{\infty}(-1+2\pi^2)^{-k}\binom{\frac{1}{2}}{k}}$$

$$\frac{1817.94 \times 0.05^{1.5}}{\sqrt{2\pi^2}} = \frac{20.3252}{\sqrt{-1+2\pi^2}\sum_{k=0}^{\infty}\frac{(-1)^k(-1+2\pi^2)^{-k}\left(-\frac{1}{2}\right)_k}{k!}}$$

$$\frac{1817.94 \times 0.05^{1.5}}{\sqrt{2\pi^2}} = \frac{20.3252}{\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2\pi^2-z_0)^k z_0^{-k}}{k!}}$$

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

From:

$$\mathcal{R}_k \sim \int \frac{d\eta}{z^2} \sim (t_B - t)^{1-3n} .$$

$$\delta\phi_k = \sqrt{2M_P^2\epsilon}\mathcal{R}_k \left(1 - \frac{\frac{H}{a}\int^t a\mathcal{R}_k\epsilon\ dt'}{\mathcal{R}_k}\right) \simeq \sqrt{2M_P^2\epsilon}\mathcal{R}_k$$
$$\sim (t_B - t)^{1-3n} , \qquad (12)$$

Considering:

$V_0, \lambda_1, \lambda_3 > 0,\ V_0 \ll 1$ and $V_0 \gg \lambda_1\phi + \frac{\lambda_3}{3!}\phi^3$

from:

$$2\epsilon_{Mat} M_P^2 = 3M_P^2$$

we obtain:

2*x*(2.435*10^18)^2 = 3(2.435*10^18)^2

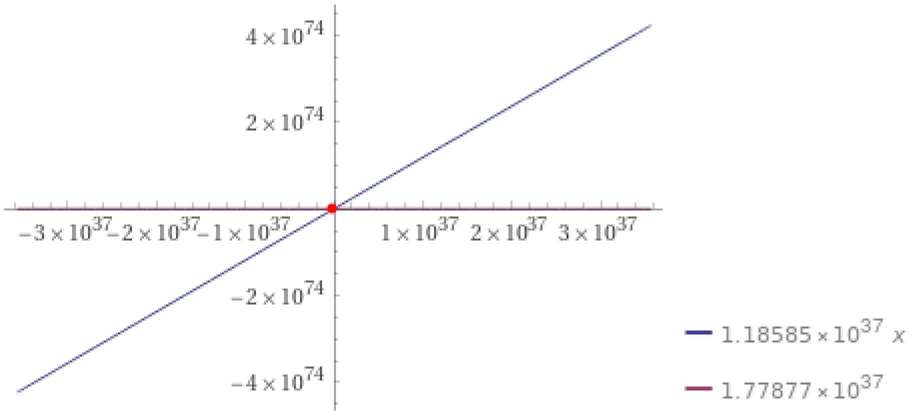
Input interpretation

$2\,x\,(2.435\times 10^{18})^2 = 3\,(2.435\times 10^{18})^2$

Result

$1.18585\times 10^{37}\,x = 1.77877\times 10^{37}$

Plot



Alternate form

$1.18585\times10^{37}\,x - 1.77877\times10^{37} = 0$

Alternate form assuming x is real

$1.18585\times10^{37}\,x + 0 = 1.77877\times10^{37}$

Solution

$x \approx 1.5$

x = 3/2 = ϵ

Thence:

2*3/2*(2.435*10^18)^2

Input interpretation

$2\times\frac{3}{2}(2.435\times10^{18})^2$

Result

17787675000000000000000000000000000000

Scientific notation

1.7787675×10^{37}

$1.7787675*10^{37}$

From:

$$\delta\phi_k = \sqrt{2M_P^2\epsilon\mathcal{R}_k}\left(1-\frac{\frac{H}{a}\int^t a\mathcal{R}_k\epsilon\, dt'}{\mathcal{R}_k}\right) \simeq \sqrt{2M_P^2\epsilon\mathcal{R}_k} \sim (t_B - t)^{1-3n}, \quad (12)$$

Sqrt(2*(2.435*10^18)^2*3/2)*1817.94

Input interpretation

$$\sqrt{2\left(2.435\times 10^{18}\right)^2\times\frac{3}{2}}\times 1817.94$$

Result

$7.66724\ldots\times 10^{21}$

$7.66724\ldots*10^{21}$

Furthermore, from:

$$\left(\frac{l_{Frag}}{1/H_{Frag}}\right)^3 \simeq \frac{H_{Frag}}{H_*} \sim \frac{\sqrt{\epsilon_{Mat}}M_P}{H_{Kin}} \gg 1,$$

we obtain:

((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18)

Input interpretation

$$\frac{\sqrt{\frac{3}{2}}\times 2.435\times 10^{18}}{2.301\times 10^{-18}}$$

Result

$1.29607\ldots\times 10^{36}$

$1.29607\ldots*10^{36}$

From:

$$\frac{1}{4}\left(3\left(2.435\times 10^{18}\right)^2\right)$$

and

$$\frac{\sqrt{\frac{3}{2}} \times 2.435 \times 10^{18}}{2.301 \times 10^{-18}}$$

we obtain also:

1/2(0.9991104684+0.9568666373)+1/((((1/4(3(2.435*10^18)^2)) / (((((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18))))))^1/3)

where 0.9991104684 and 0.9568666373 are the values of the following Rogers-Ramanujan continued fractions:

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

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

Input interpretation

$$\frac{1}{2}(0.9991104684 + 0.9568666373) + \frac{1}{\sqrt[3]{\frac{\frac{1}{4}\left(3\left(2.435 \times 10^{18}\right)^2\right)}{\frac{\sqrt{\frac{3}{2}} \times 2.435 \times 10^{18}}{2.301 \times 10^{-18}}}}}$$

Result

1.641002901498090466953280094296942079833670730894355277487121325 8
...

$1.641002901498\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$ (trace of the instanton shape)

Now, we observe that, from the two expressions:

$$2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2$$

and

$$\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)$$

we obtain:

((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))

Input interpretation

$$\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}$$

Result

4

4

and from which, after some easy calculations:

((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))^3

Input interpretation

$$\left(\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\right)^3$$

Result

64

$64 = 8^2$

And again:

27((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))^3+1

Input interpretation

$$27\left(\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\right)^3+1$$

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)

(27((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))^3+1)^1/15

Input interpretation

$$\sqrt[15]{27\left(\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\right)^3+1}$$

Result

1.643815228748728131...

1.64381522874…. $\approx \zeta(2) = \frac{\pi^2}{6} = 1.644934$ ... (trace of the instanton shape)

(((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))^3)^2

Input interpretation

$$\left(\left(\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\right)^3\right)^2$$

Result

4096

$4096 = 64^2$ where 4096 and 64 are fundamental values indicated in the Ramanujan paper "**Modular equations and Approximations to π**"

From:

$$2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2$$

and

$$\frac{\sqrt{\frac{3}{2}}\times2.435\times10^{18}}{2.301\times10^{-18}}$$

we obtain:

(2*3/2*(2.435*10^18)^2) 1/(((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18))

Input interpretation

$$\left(2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2\right)\times\frac{1}{\frac{\sqrt{\frac{3}{2}}\times2.435\times10^{18}}{2.301\times10^{-18}}}$$

Result

13.724331811980865977622999847112253586244725947533080046050028329
…

13.72433181198….

And dividing also from:

$$\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\times 1817.94$$

we obtain :

(2*3/2*(2.435*10^18)^2) 1/(((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18)) *1/((((0.050^(1.5))/(sqrt(2Pi^2))* 1817.94)))

Input interpretation

$$\left(2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2\right)\times\frac{1}{\frac{\sqrt{\frac{3}{2}\times2.435\times10^{18}}}{2.301\times10^{-18}}}\times\frac{1}{\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\times1817.94}$$

Result

3.00000…

3

Multiplying by the previous expression

$$\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}$$

we obtain also:

((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))(2*3/2*(2.435*10^18)^2) 1/(((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18)) *1/((((0.050^(1.5))/(sqrt(2Pi^2))* 1817.94)))

Input interpretation

$$\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\left(2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2\right)\left(\frac{1}{\frac{\sqrt{\frac{3}{2}}\times2.435\times10^{18}}{2.301\times10^{-18}}}\times\frac{1}{\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\times1817.94}\right)$$

Result

12.0000…

12

From which:

((((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))(2*3/2*(2.435*10^18)^2) 1/(((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18)) *1/((((0.050^(1.5))/(sqrt(2Pi^2))* 1817.94)))))^3+1

Input interpretation

$$\left(\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\left(2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2\right)\left(\frac{1}{\frac{\sqrt{\frac{3}{2}}\times2.435\times10^{18}}{2.301\times10^{-18}}}\times\frac{1}{\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\times1817.94}\right)\right)^3+1$$

Result

1729.00…

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)

(((((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))(2*3/2*(2.435*10^18)^2) 1/(((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18)) *1/((((0.050^(1.5))/(sqrt(2Pi^2))* 1817.94)))))^3+1)^1/15

Input interpretation

$$\left(\left(\frac{2\times\frac{3}{2}(2.435\times10^{18})^2}{\frac{1}{4}(3(2.435\times10^{18})^2)}\left(2\times\frac{3}{2}(2.435\times10^{18})^2\right)\left(\frac{1}{\frac{\sqrt{\frac{3}{2}}\times2.435\times10^{18}}{2.301\times10^{-18}}}\times\frac{1}{\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\times1817.94}\right)\right)^3+1\right)\hat{}\,(1/15)$$

Result

1.64382…

$1.64382\ldots \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$ (trace of the instanton shape)

(1/27(((((2*3/2*(2.435*10^18)^2)/(1/4(3(2.435*10^18)^2)))(2*3/2*(2.435*10^18)^2) 1/(((Sqrt(3/2)*(2.435*10^18)))/(2.301*10^-18)) *1/((((0.050^(1.5))/(sqrt(2Pi^2))* 1817.94)))))^3))^2

Input interpretation

$$\left(\frac{1}{27}\left(\frac{2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2}{\frac{1}{4}\left(3\left(2.435\times10^{18}\right)^2\right)}\left(2\times\frac{3}{2}\left(2.435\times10^{18}\right)^2\right)\left(\frac{1}{\frac{\sqrt{\frac{3}{2}}\times2.435\times10^{18}}{2.301\times10^{-18}}}\times\frac{1}{\frac{0.05^{1.5}}{\sqrt{2\pi^2}}\times1817.94}\right)\right)^3\right)^2$$

Result

4096.02…

4096.02….≈ 4096 = 64^2 where 4096 and 64 are fundamental values indicated in the Ramanujan paper "**Modular equations and Approximations to π**"

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AdS cycles in eternally inflating background
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