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4.666 based expressions

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Abstract
Maclaurin series and series of Euler number are basic series and are taught all over the world to children. The series based on Maclaurin and Euler number are fundamental in nature. But an important development to the Maclaurin series and Euler number is the use of consecutive numbers. Consecutive numbers are not just a mindset of all of us. They help in the development of functions similar to Maclaurin series and Euler number. 4.666 is the number that we get when consecutive numbers are used following the Maclaurin series and the Euler Number e series. In this paper the basic Maclaurin series and e series are outlined and also rigorous explanation and the similarity to the consecutive number based 4.666 series are explained.

Keywords
Maclaurin series, Euler number e, e series, 4.666 series, sin(x) series, cos(x) series, one(x) series, zero(x) series

Introduction
Maclaurin made series named after him after considering the Taylor series around zero. Some of the Maclaurin series are sin(x), cos(x) and log(x). The following are the expressions of e^x, ln(x), cos(x) and sin(x)

$$e^x = \sum_0^\infty \frac{x^n}{n!}$$

$$\ln(x) = \sum_1^\infty (-1)^{(n+1)} \frac{(x-1)^n}{n}$$

$$\cos(x) = \sum_0^\infty (-1)^n \frac{x^{2n}}{(2n)!}$$

$$\sin(x) = \sum_0^\infty (-1)^n \frac{x^{(2n+1)}}{(2n+1)!}$$

While working on the relationship between consecutive numbers and factorials, the following was observed. This is an approximate expression and works in selected range only.

$$(2n)! \approx \left(\frac{(n+1)(n+2)}{2}\right)^n 3.3^{(-0.00000002375*n^4+0.00000596458*n^3-0.000595531*n^2+0.1006565*n-0.588125)}$$

Then the factor $\left(\frac{\left(\frac{(n+1)(n+2)}{2}\right)^n}{(2n)!}\right)$ was used in an infinite series with $\left(\frac{1}{x}\right)^n$.

This gave rise to new possibilities and results of great importance were obtained.

4.666 to the power $\frac{1}{x}$

$$4.666^{\frac{1}{x}} \approx \sum_{0}^{\infty} \frac{\left(\frac{((n+1)(n+2)}{2}\right)^n}{(2n)!}\left(\frac{1}{x}\right)^n$$

Log equivalent to 4.666 to the power $\frac{1}{x}$

$$4.666\log = (x+1)\ln\left(\frac{x+1}{x}\right) - 1 = \sum_{1}^{\infty}(-1)^{(n+1)}\frac{\left(\frac{1}{x}\right)^n}{n(n+1)}$$

One(x) function

$$one(x) = \sum_{0}^{\infty}(-1)^n \frac{\left(\frac{(n+2)(n+3)}{2}\right)^{(2n)}}{(4n)!}\left(\frac{1}{x}\right)^{(2n)}$$

Zero(x) function

$$zero(x) = \sum_{0}^{\infty}(-1)^n \frac{\left(\frac{(n+3)(n+4)}{2}\right)^{(2n+1)}}{(4n+2)!}\left(\frac{1}{x}\right)^{(2n+1)}$$

Integral for 2n factorial

$$(2n)! \approx \left(\frac{(n+1(n+2)}{2}\right)^n \int_{\left(0.915961-\frac{1654391}{\left(1+\left(\frac{n}{0.000001011}\right)^{0.8329756}\right)}\right)}^{\infty} \frac{1}{4.666^x}\frac{1}{x^n}dx$$

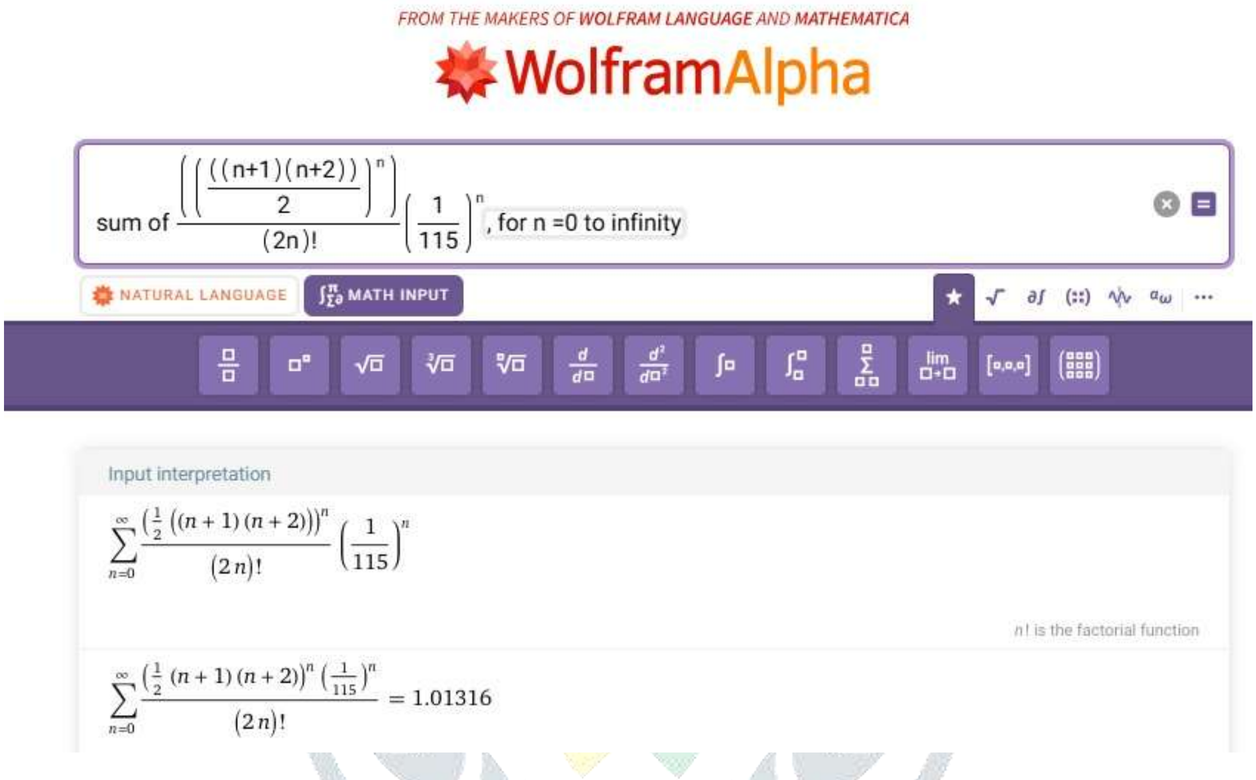
Ln(x) function

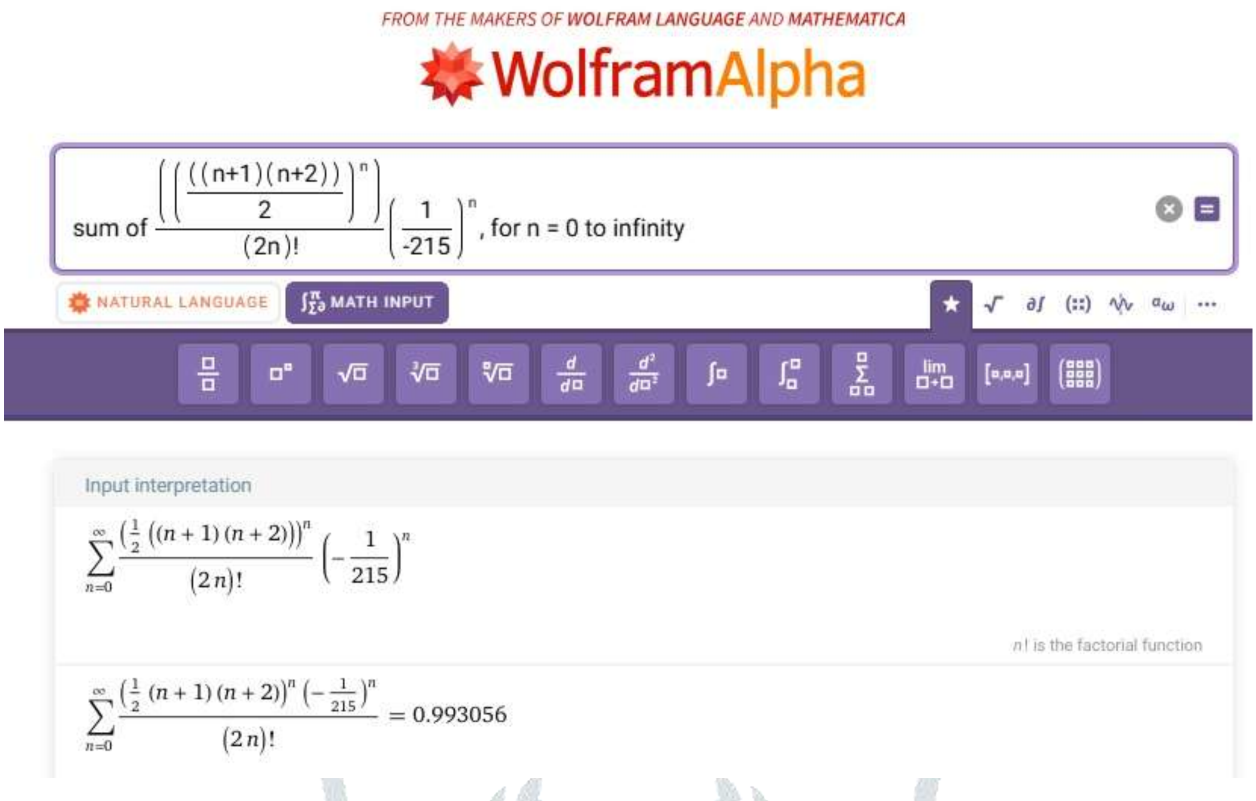
$$\ln(x) \approx \sum_{n=1}^{x}\frac{0.5+n}{(n(n+1)} - 0.077$$

4.666 to the power $\frac{1}{x}$

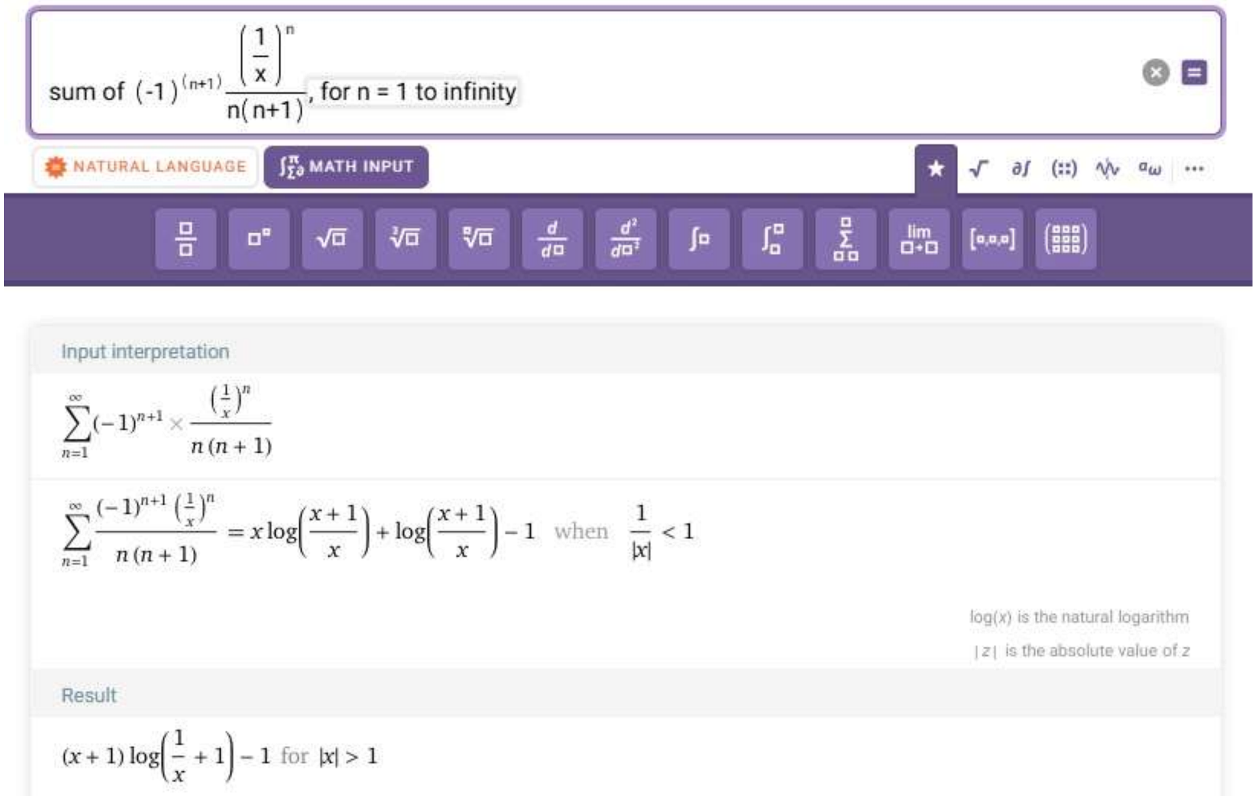
$$4.666^{\frac{1}{x}} \approx (x+1)\left(\frac{0.544+(x-1)}{(x-1)x}\right)$$

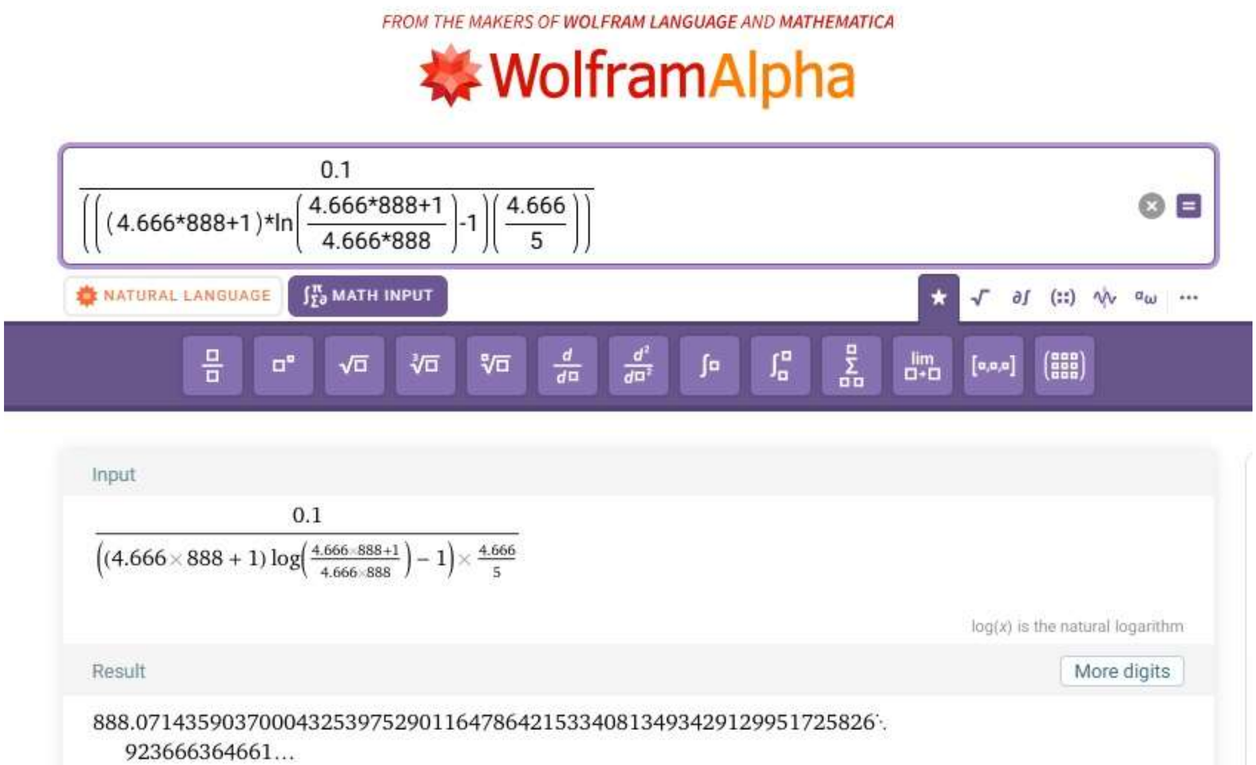
Wolfram Alpha Screenshots

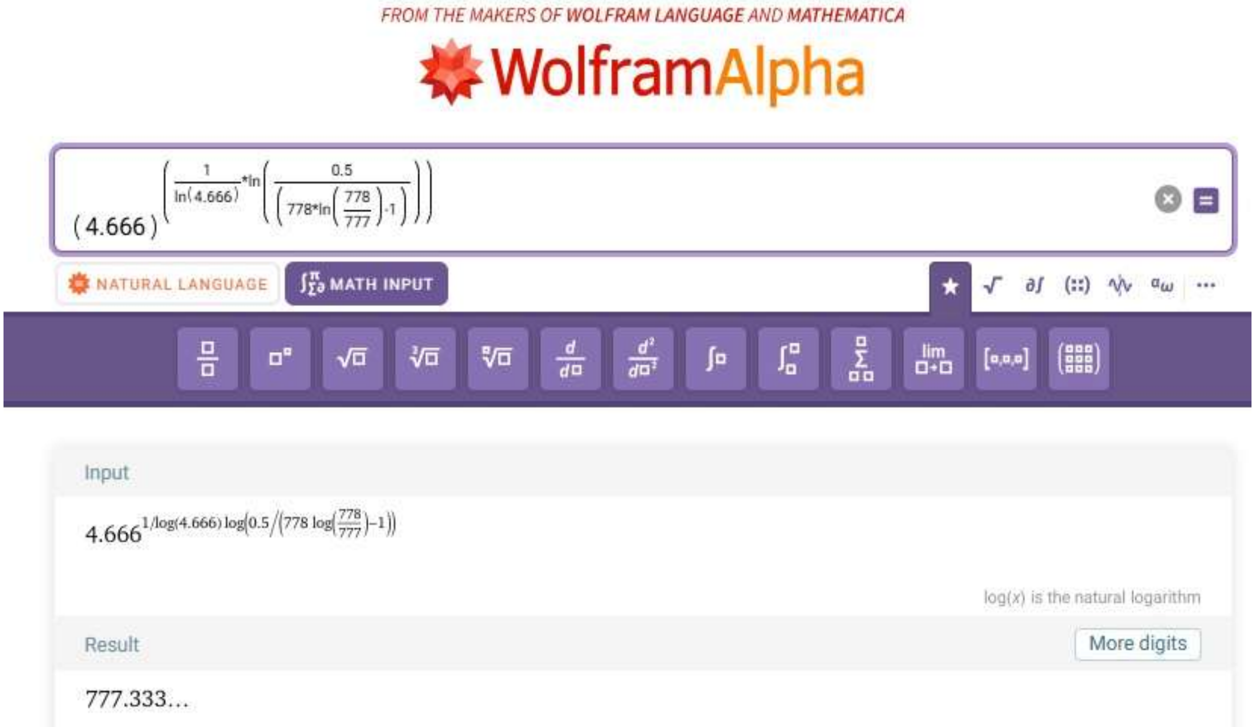


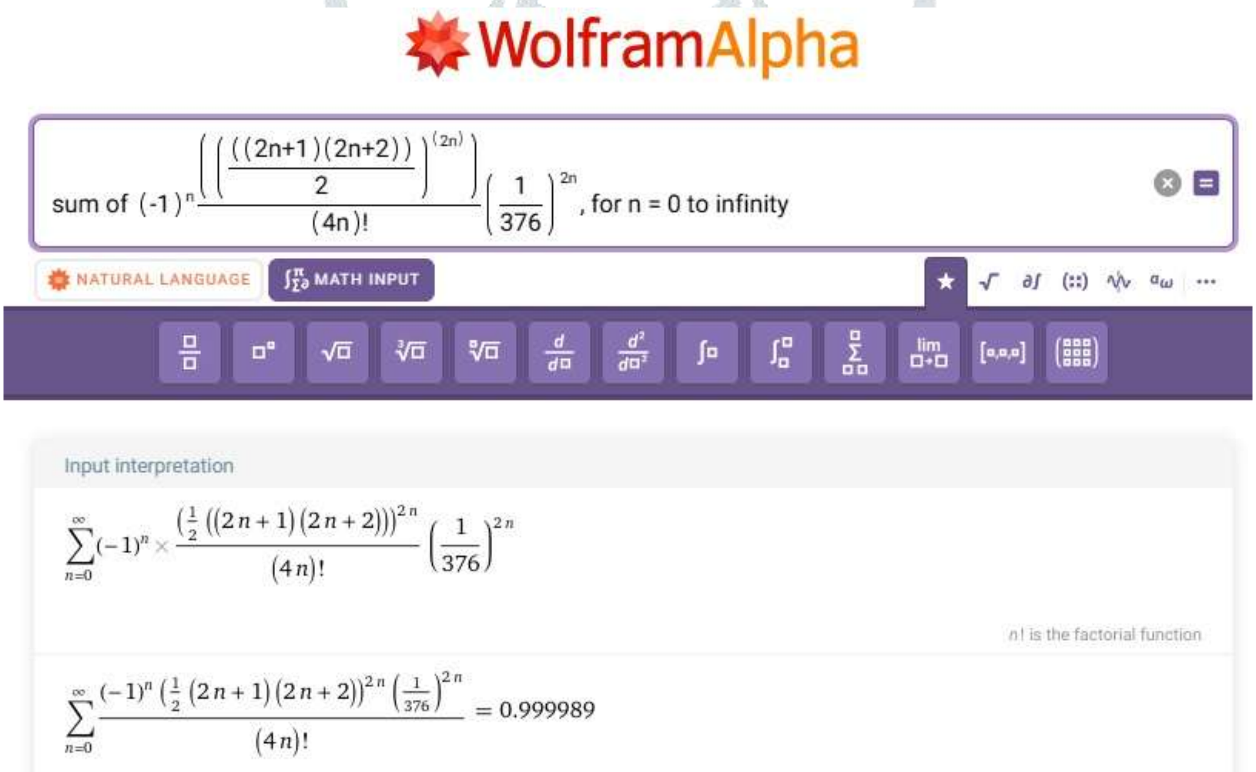

FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
sum of $\frac{\left(\left(\frac{((n+1)(n+2))}{2}\right)^n\right)}{(2n)!}\left(\frac{1}{-215}\right)^n$, for n = 0 to infinity
NATURAL LANGUAGE
MATH INPUT
Input interpretation
$\sum_{n=0}^{\infty}\frac{\left(\frac{1}{2}\left((n+1)(n+2)\right)\right)^n}{(2n)!}\left(-\frac{1}{215}\right)^n$
n! is the factorial function
$\sum_{n=0}^{\infty}\frac{\left(\frac{1}{2}(n+1)(n+2)\right)^n\left(-\frac{1}{215}\right)^n}{(2n)!} = 0.993056$

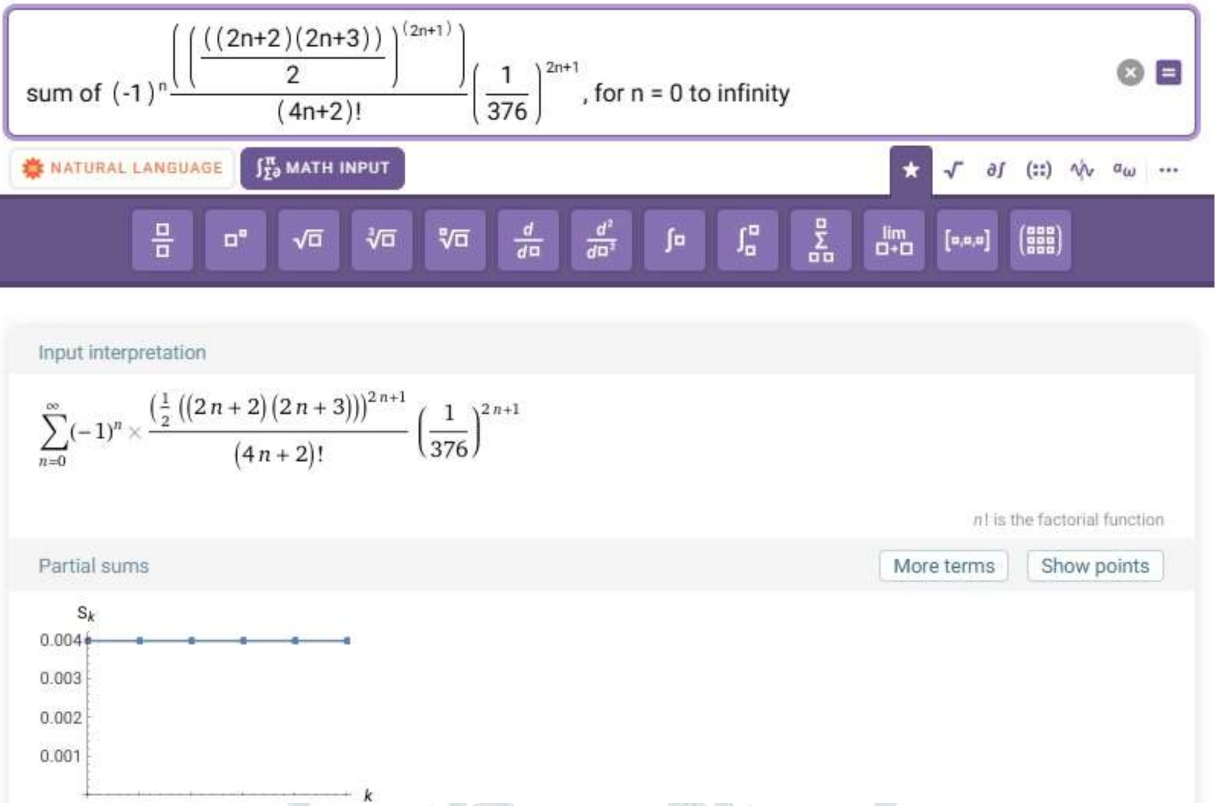

FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
$(4.666)^{\frac{1}{-215}}$
NATURAL LANGUAGE
MATH INPUT
Input
$4.666^{-1/215}$
Result
More digits
0.99286141…

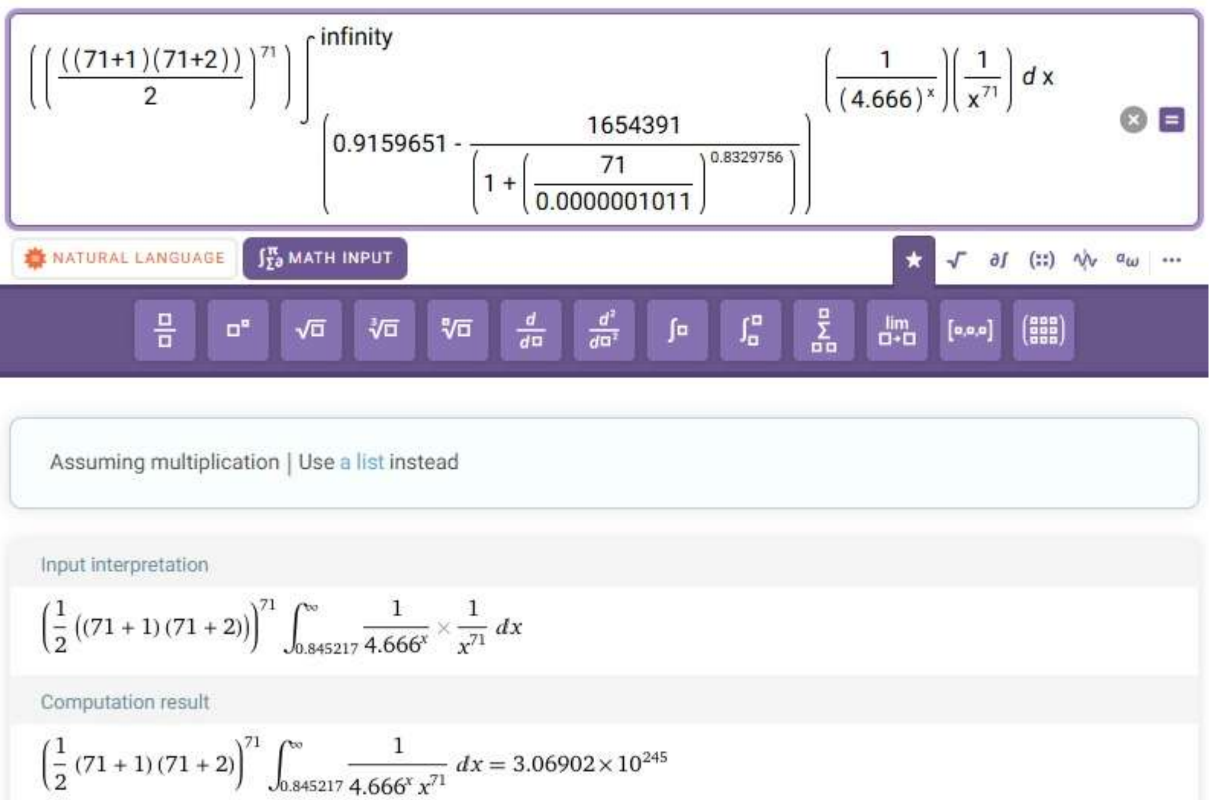

sum of $(-1)^{(n+1)}\frac{\left(\frac{1}{x}\right)^n}{n(n+1)}$, for n = 1 to infinity
NATURAL LANGUAGE
MATH INPUT
Input interpretation
$\sum_{n=1}^{\infty}(-1)^{n+1}\times\frac{\left(\frac{1}{x}\right)^n}{n(n+1)}$
$\sum_{n=1}^{\infty}\frac{(-1)^{n+1}\left(\frac{1}{x}\right)^n}{n(n+1)} = x\log\left(\frac{x+1}{x}\right)+\log\left(\frac{x+1}{x}\right)-1$ when $\frac{1}{|x|}<1$
log(x) is the natural logarithm
|z| is the absolute value of z
Result
$(x+1)\log\left(\frac{1}{x}+1\right)-1$ for $|x|>1$

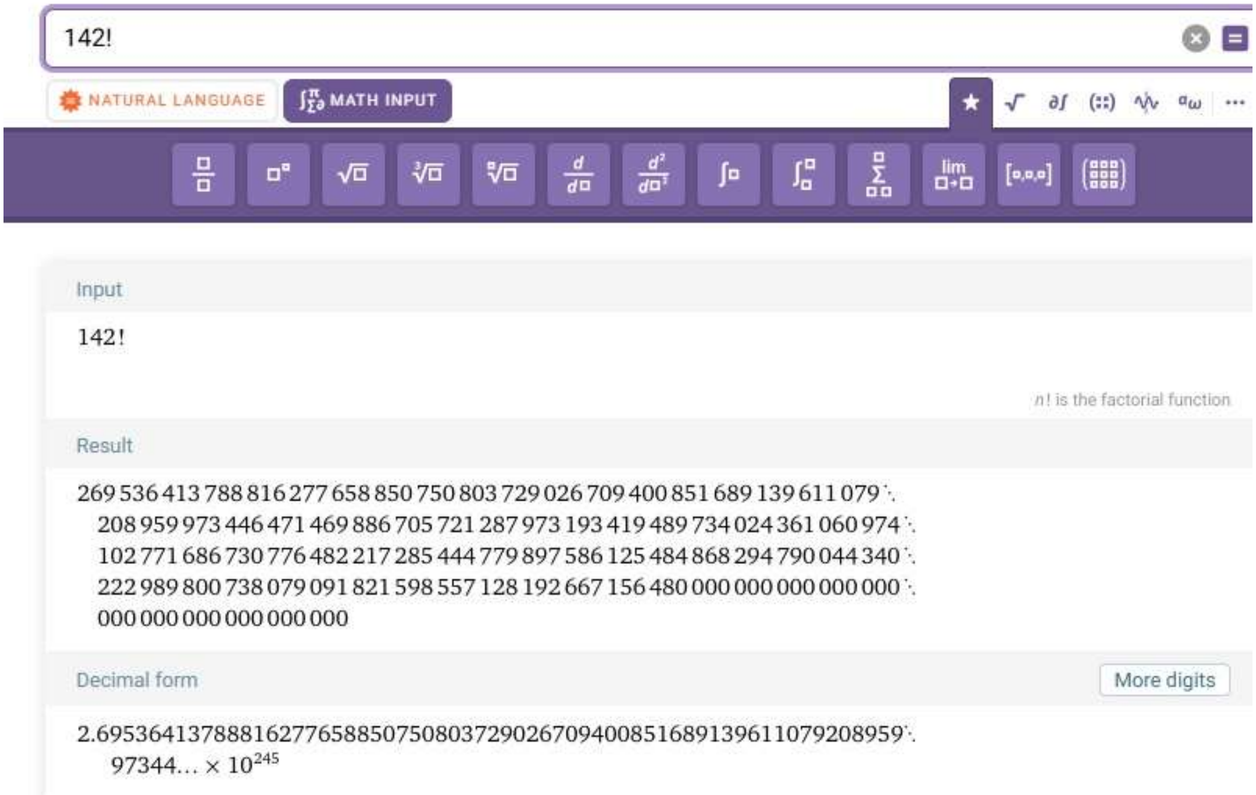

FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
$\frac{0.1}{\left(\left((4.666*888+1)*\ln\left(\frac{4.666*888+1}{4.666*888}\right)-1\right)\left(\frac{4.666}{5}\right)\right)}$
NATURAL LANGUAGE
MATH INPUT
Input
$\frac{0.1}{\left((4.666\times888+1)\log\left(\frac{4.666\times888+1}{4.666\times888}\right)-1\right)\times\frac{4.666}{5}}$
log(x) is the natural logarithm
Result
More digits
888.0714359037000432539752901164786421533408134934291299517258269 23666364661…

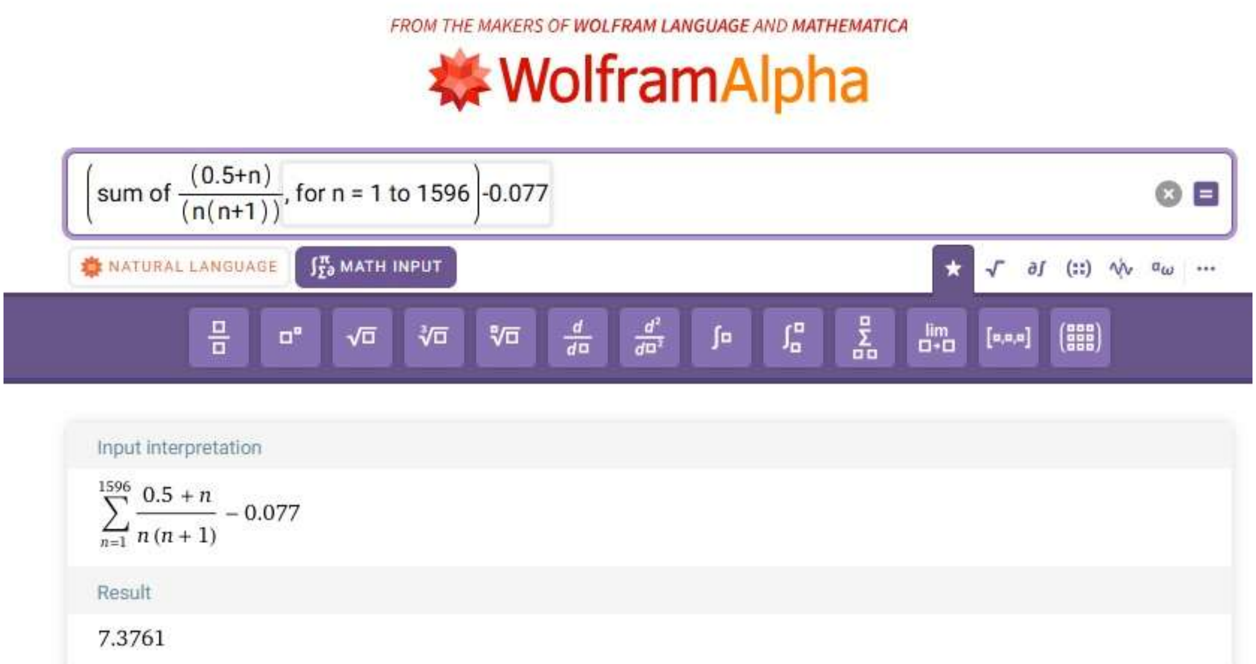

FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
NATURAL LANGUAGE
MATH INPUT
Input
$4.666^{1/\log(4.666)\log\left(0.5/\left(778\log\left(\frac{778}{777}\right)-1\right)\right)}$
log(x) is the natural logarithm
Result
More digits
777.333...

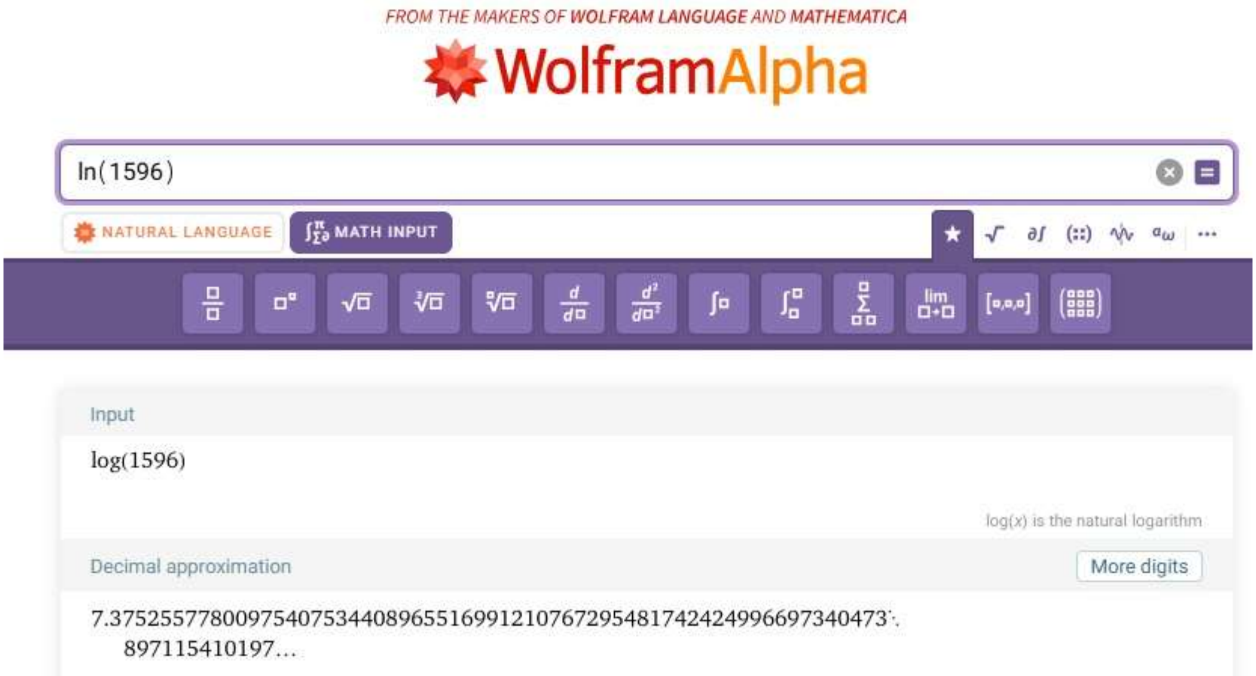

WolframAlpha
sum of (-1)^n (((2n+1)(2n+2))/2)^(2n)/(4n)! (1/376)^(2n), for n = 0 to infinity
NATURAL LANGUAGE
MATH INPUT
Input interpretation
$\sum_{n=0}^{\infty}(-1)^n \times \frac{\left(\frac{1}{2}\left((2n+1)(2n+2)\right)\right)^{2n}}{(4n)!}\left(\frac{1}{376}\right)^{2n}$
n! is the factorial function
$\sum_{n=0}^{\infty}\frac{(-1)^n\left(\frac{1}{2}(2n+1)(2n+2)\right)^{2n}\left(\frac{1}{376}\right)^{2n}}{(4n)!} = 0.999989$

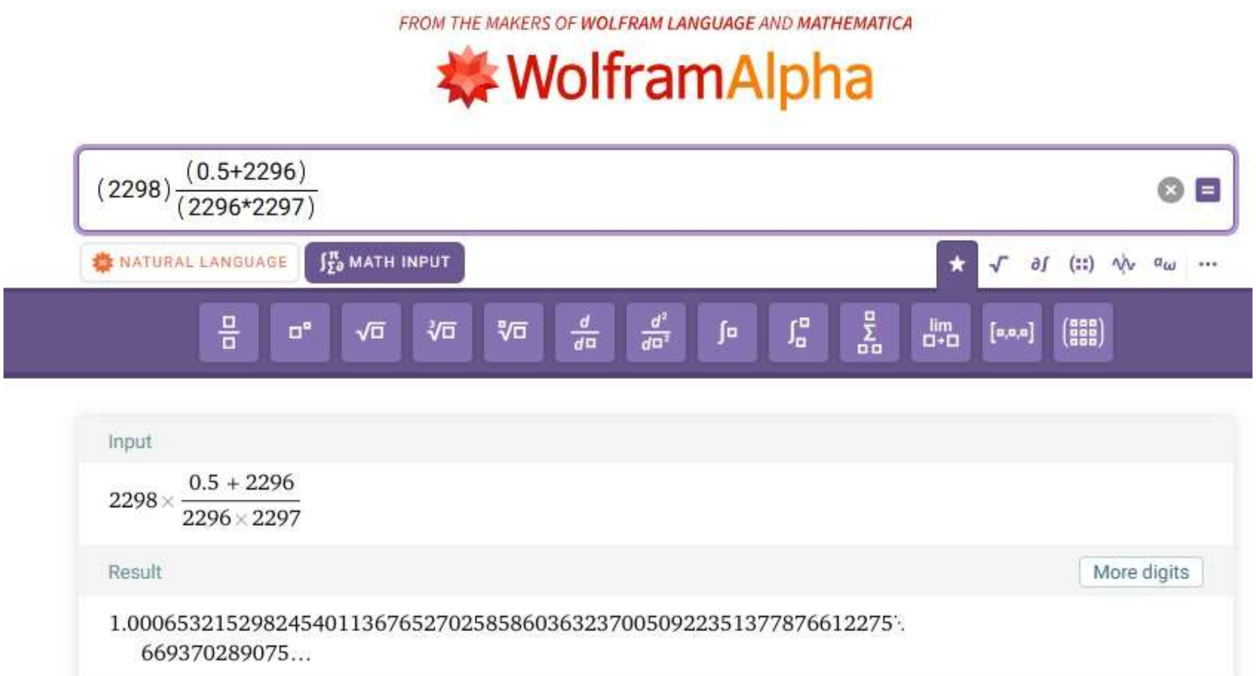

sum of (-1)^n ((((2n+2)(2n+3))/2)^(2n+1))/(4n+2)! (1/376)^(2n+1), for n = 0 to infinity
NATURAL LANGUAGE
MATH INPUT
Input interpretation
$\sum_{n=0}^{\infty}(-1)^n \times \frac{\left(\frac{1}{2}\left((2n+2)(2n+3)\right)\right)^{2n+1}}{(4n+2)!}\left(\frac{1}{376}\right)^{2n+1}$
n! is the factorial function
Partial sums
More terms
Show points
s_k
0.004
0.003
0.002
0.001
k

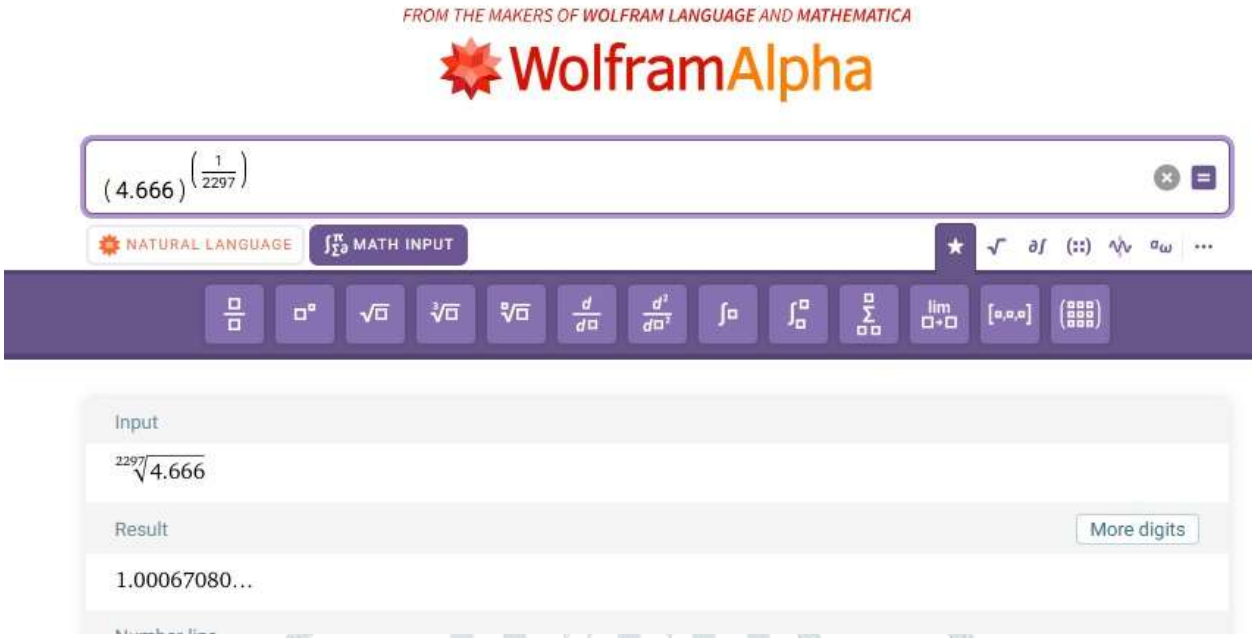

$\left(\left(\frac{((71+1)(71+2))}{2}\right)^{71}\right)\int_{\left(0.9159651-\frac{1654391}{\left(1+\left(\frac{71}{0.0000001011}\right)^{0.8329756}\right)}\right)}^{\text{infinity}}\left(\frac{1}{(4.666)^x}\right)\left(\frac{1}{x^{71}}\right)dx$
NATURAL LANGUAGE
MATH INPUT
Assuming multiplication | Use a list instead
Input interpretation
$\left(\frac{1}{2}\left((71+1)(71+2)\right)\right)^{71}\int_{0.845217}^{\infty}\frac{1}{4.666^x}\times\frac{1}{x^{71}}\,dx$
Computation result
$\left(\frac{1}{2}(71+1)(71+2)\right)^{71}\int_{0.845217}^{\infty}\frac{1}{4.666^x\,x^{71}}\,dx = 3.06902\times10^{245}$


142!
NATURAL LANGUAGE
MATH INPUT
Input
142!
n! is the factorial function
Result
269 536 413 788 816 277 658 850 750 803 729 026 709 400 851 689 139 611 079
208 959 973 446 471 469 886 705 721 287 973 193 419 489 734 024 361 060 974
102 771 686 730 776 482 217 285 444 779 897 586 125 484 868 294 790 044 340
222 989 800 738 079 091 821 598 557 128 192 667 156 480 000 000 000 000 000
000 000 000 000 000 000
Decimal form
More digits
2.695364137888162776588507508037290267094008516891396110792089597
97344... × 10^245


FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
(sum of (0.5+n)/(n(n+1)), for n = 1 to 1596)-0.077
NATURAL LANGUAGE
MATH INPUT
Input interpretation
$\sum_{n=1}^{1596} \frac{0.5+n}{n(n+1)} - 0.077$
Result
7.3761


FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
ln(1596)
NATURAL LANGUAGE
MATH INPUT
Input
log(1596)
log(x) is the natural logarithm
Decimal approximation
More digits
7.37525577800975407534408965516991210767295481742424996697340473897115410197…


FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA
WolframAlpha
(2298)(0.5+2296)/(2296*2297)
NATURAL LANGUAGE
MATH INPUT
Input
2298 × (0.5 + 2296)/(2296 × 2297)
Result
More digits
1.00065321529824540113676527025858603632370050922351377876612275669370289075…



Conclusion

In total five expressions have been submitted in this paper which are similar to Maclaurin series and e series. The expressions have been tested in Wolframalpha. The results have been found to be valid in most ranges of natural numbers. The one(x) and zero(x) numbers are very interesting and their values goes towards 1 and 0 respectively as the value of x increases. The 4.666 to the power $\frac{1}{x}$ and its log equivalent show a surprising similarity to e function and log function relationship.

References

1. www.wolframalpha.com
2. www.wikipedia.org