

#0 Alpha Ciphering
MA@ National Convention 2017

Simplify

$$\left(\sqrt[3]{71} - \sqrt[3]{65}\right)\left(\sqrt[3]{5041} + \sqrt[3]{4615} + \sqrt[3]{4225}\right)$$

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Find the value(s) of a such that the system of equations has no real solution.

$$\begin{cases} x + 2y - 3z = 4 \\ 3x - y + 5z = 2 \\ 4x + y + (a^2 - 14)z = a + 2 \end{cases}$$

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$$\log_a(10) + \dots + \log_a(10^n) + \dots + \log_a(10^{10}) = 110.$$

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If $\sin x + \cos x = -1$, find the value of
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Simplify $\ln\left[-(i \cos 1 + \sin 1)^2\right]$, where the natural logarithm is defined over the complex numbers and the imaginary part of the value is as close to 0 as possible.

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The product of the ages of a group of teenagers is 10584000. What is the sum of their ages?

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#8 Alpha Ciphering
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$$\cos\left(\frac{\pi}{6}\right) + \dots + \cos\left(\frac{n\pi}{6}\right) + \dots + \cos\left(\frac{2017\pi}{6}\right).$$

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#9 Alpha Ciphering
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The coefficients of the third and eleventh terms of the expansion of $(a + b)^n$ are the same (when the terms are written in descending power of a and n is a positive integer). Find the sum of the coefficient of the fifth term and all positive integral divisors of that coefficient.

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If $(a+b+c+d+e+f+g)^5$ is expanded and simplified, how many terms will contain only three letters?

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Find the area enclosed by the triangle whose vertices are $(1, 0, 4)$, $(3, -3, 0)$, and $(0, 1, 2)$.

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