

#1 Precalculus - Hustle
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Given vectors $u = \langle 5, 20, 0 \rangle$ and $v = \langle 2, -1, 12 \rangle$.
Find the dot product of the two vectors.

Answer : _____

Round 1 2 3 4 5

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#2 Precalculus - Hustle
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Express $N = \frac{\sqrt{6}}{1+\sqrt{6}}$ in simplest form with a positive integer denominator.

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#3 Precalculus - Hustle
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Find the smallest possible angle of rotation (in degrees, clockwise or counterclockwise) needed to eliminate the xy term from:

$$7x^2 + 4\sqrt{3}xy + 3x - 8y - 5y^2 + 7 = 0$$

Answer : _____

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#4 Precalculus - Hustle
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Find $x + y$ if $x = \sqrt{20 - \sqrt{20 - \sqrt{20 - \dots}}}$
and $y = (\sqrt{2}i - \sqrt{6})^6$

Answer : _____

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#5 Precalculus - Hustle
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The range of the function

$$f(x) = \tan^{-1} \theta$$

can be expressed as (a, b) . Compute $a + b$.

Answer : _____

Round 1 2 3 4 5

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#6 Precalculus - Hustle
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Find the determinant of:

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

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Find the determinant of:

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#8 Precalculus - Hustle
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Compute:

$$\tan\left(\arccos\left(\sin\left(-\frac{\pi}{6}\right)\right)\right)$$

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#9 Precalculus - Hustle
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Given: $6^x + 36^x = 72$ and $\log_6 y = x$, find y .

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#10 Precalculus - Hustle
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When the solutions to $x^6 - 4096 = 0$ are graphed on the complex (Argand) plane, they can be connected to form a hexagon. What is the area enclosed by the hexagon?

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#11 Precalculus - Hustle
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What is the sum of the reciprocals of the roots of

$$S(x) = 12x^6 - 7x^4 - 6x^3 + 12x + 4$$

Answer : _____

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#12 Precalculus - Hustle
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Let $f(x) = \frac{(x-3)^2}{x^2-5x+6}$. Find the equations of all asymptotes in the graph of $f(x)$.

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#13 Precalculus - Hustle
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Solve for x :

$$\log_{\sqrt{6}} \begin{vmatrix} 2 & 3 & 2 \\ 2 & 3 & 1 \\ 4 & 9 & 1 \end{vmatrix} = x$$

Answer : _____

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#14 Precalculus - Hustle
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Simplify:

$$\log_{11} 625 \cdot \log_7 243 \cdot \log_5 14641 \cdot \log_3 16807$$

Answer : _____

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#15 Precalculus - Hustle
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If $ABCDEF$ is a regular hexagon with $EA = 3\sqrt{3}$, compute its area.

Answer : _____

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#16 Precalculus - Hustle
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If $\log_2(\log_3(\log_7(\log_{15}(S)))) = 6$, then how many distinct positive prime numbers are factors of S ?

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#17 Precalculus - Hustle
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For all nonzero real numbers x ,

$$2f(x) + f\left(\frac{1}{x}\right) = x$$

Find $f(x)$ as a single fraction.

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#18 Precalculus - Hustle
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Evaluate:

$$\sum_{n=1}^{\infty} \frac{1}{n^2 + 6n + 8}$$

Answer : _____

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#19 Precalculus - Hustle
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Find the positive difference between the maximum and minimum y values among all points on the polar graph

$$r^2 = -6r \cos \theta + 7$$

Answer : _____

Round 1 2 3 4 5

#19 Precalculus - Hustle
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#20 Precalculus - Hustle
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Aditi, Angela, Anjana, Devika, and Navya are playing a dice game, where the players roll one fair six-sided die. Aditi starts, and they take turns in the aforementioned order. If the first person to roll a 5 or higher wins, what is the probability that Anjana wins?

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#21 Precalculus - Hustle
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Compute:

$$\frac{\sin \frac{\pi}{12} + \cos \frac{\pi}{12}}{\sin^3 \frac{\pi}{12} + \cos^3 \frac{\pi}{12}}$$

Answer : _____

Round 1 2 3 4 5

#21 Precalculus - Hustle
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#22 Precalculus - Hustle
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Let $T(x)$ be an odd cubic polynomial with a root at $x = 11$. If its other roots are n and s , then what is the value of $n^2 + s^2$?

Answer : _____

Round 1 2 3 4 5

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#23 Precalculus - Hustle
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The graph of the equation

$$x^2 - y^2 + 6x + 4y + 5 = 0$$

is a pair of intersecting lines. Compute the sum of the coordinates of the y-intercepts of the two lines.

Answer : _____

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#24 Precalculus - Hustle
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Find the amplitude of:

$$N(x) = 3 \sin\left(x - \frac{\pi}{4}\right) + 4 \cos\left(x + \frac{\pi}{4}\right)$$

Answer : _____

Round 1 2 3 4 5

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#25 Precalculus - Hustle
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Compute:

$$\sin\left(\tan^{-1}\left(-\frac{3}{4}\right) + \cot^{-1}\left(-\frac{5}{12}\right)\right)$$

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