



**Hustle
Pre-Calculus
Test #643**



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#1 Pre-calculus - Hustle
MAΘ National Convention 2018

$$\begin{vmatrix} -1 & 2 & 3 & 1 \\ 0 & 3 & 4 & -5 \\ 1 & 0 & 0 & -2 \\ 5 & 1 & -3 & 2 \end{vmatrix} =$$

Answer : _____

Round 1 2 3 4 5

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#2 Pre-calculus - Hustle
MAΘ National Convention 2018

How many total asymptotes (vertical, horizontal, or slant) does the function have?

$$f(x) = \frac{x^3 - 8}{x^2 - 3x - 4}$$

Answer : _____

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#3 Pre-calculus – Hustle
MAΘ National Convention 2018

Find the area of $\triangle ABC$ if $a = 9$, $b = 12$,
and $\angle C = 60^\circ$. Sides are labeled with the same
letters as the angle opposite them.

Answer : _____

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#4 Pre-calculus - Hustle
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$$\cos\left(2 \sin^{-1}\left(-\frac{1}{3}\right)\right) + \tan\left(\sec^{-1}\left(-\frac{13}{12}\right)\right) =$$

Answer : _____

Round 1 2 3 4 5

#4 Pre-calculus - Hustle
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#5 Pre-calculus – Hustle
MAΘ National Convention 2018

The diameter of a cylinder is equal to half of the height of the cylinder. Express the volume of the cylinder in terms of the height h .

Answer : _____

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#6 Pre-calculus - Hustle
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How many times will $y = 5 \cos x + 1$ intersect the x-axis on $[-2\pi, 2\pi]$?

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#7 Pre-calculus - Hustle
MAΘ National Convention 2018

Given: $3^{3^x} + 9^{3^x} = 20$ and $\log_3 y = x$

Find the exact value of y .

Answer : _____

Round 1 2 3 4 5

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#8 Pre-calculus - Hustle
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Which statement is FALSE?

A. $\sin^2\left(\frac{\pi}{2} - x\right) + \sin^2 x = 1$

B. $\frac{1}{\sin^2 x} + \left(\frac{1}{\tan x}\right)^2 = 1$

C. $\cos^2(-x) + \sin^2(-x) = 1$

D. $\csc^2 x(1 - \cos^2 x) = 1$

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#9 Pre-calculus - Hustle
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Find all solutions to the equation below:

$$x^3 + 2x^2 - 19x - 20 = 0$$

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#10 Pre-calculus - Hustle
MAO National Convention 2018

If the solutions to $x^6 - 64 = 0$ are graphed on the complex (Argand) plane, a hexagon is formed. What is the area enclosed by the hexagon?

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#11 Pre-calculus - Hustle
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What is the sum of the units digits of 8^{2018} , 3^{2018} , and 7^{2018} ?

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#12 Pre-calculus - Hustle
MAO National Convention 2018

Solve for x :

$$\begin{vmatrix} 1 & x & 4 \\ 3 & 0 & -2 \\ 1 & -1 & 3 \end{vmatrix} = \begin{vmatrix} 4 & 0 & 2 \\ x & 1 & -1 \\ 0 & 3 & 2 \end{vmatrix}$$

Answer : _____

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#13 Pre-calculus - Hustle
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If $f(x) = x^2 + 3x$, then what is the sum of the solutions to $f \circ f(x) = 0$?

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#14 Pre-calculus - Hustle
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The vector from the origin to $(-4, 4\sqrt{3})$ is rotated 150° clockwise about the origin. What is the terminal point (a, b) of the resulting vector?

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#15 Pre-calculus - Hustle
MAΘ National Convention 2018

Find the domain of the function, written in interval notation:

$$y = \log_{3x-2} \left(\frac{x-2}{x^2-9} \right)$$

Answer : _____

Round 1 2 3 4 5

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#16 Pre-calculus - Hustle
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Given: $x = 4cis \frac{3\pi}{4}$
 $y = 8cis \frac{\pi}{4}$

Find xy in $a + bi$ form.

Answer : _____

Round 1 2 3 4 5

#16 Pre-calculus - Hustle
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#17 Pre-calculus - Hustle
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If $\sin(2 \cdot x) = \frac{4}{9}$, find $\sin^4 x + \cos^4 x$.

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#18 Pre-calculus - Hustle
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In $\triangle ABC$, $c = 14$, $a = 28$, and $\angle C = 30^\circ$.
How many triangles are possible? Sides are labeled with the same letters as the angle opposite them.

Answer : _____

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#18 Pre-calculus - Hustle
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#19 Pre-calculus - Hustle
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$$\sum_{i=1}^{12}(\cos(i\pi) + \sin(i\pi)) =$$

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#20 Pre-calculus - Hustle
MAΘ National Convention 2018

What is the sum of the reciprocals of the roots of

$$P(x) = 3x^4 - 5x^3 + 20x^2 - 8x + 6 ?$$

Answer : _____

Round 1 2 3 4 5

#20 Pre-calculus - Hustle
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#21 Pre-calculus - Hustle
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For $y = -2 \tan\left(\frac{3\pi x}{4} - 1\right) + 4$, let P be the period and let A be the vertical shift needed to transform $y = \tan x$ into this function. Find $\frac{P}{A}$.

Answer : _____

Round 1 2 3 4 5

#21 Pre-calculus - Hustle
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#22 Pre-calculus - Hustle
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What is the exact value of

$$\frac{1}{\log_2 36} + \frac{1}{\log_3 36} ?$$

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#23 Pre-calculus - Hustle
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A ball is dropped from a height of twenty feet. Each time it rebounds 70% of its previous height. How far, in feet, will the ball travel vertically before “coming to rest”?

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#24 Pre-calculus - Hustle
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The Cartesian point (h, k) is the center of the graph represented by the equation $r = \frac{3}{1 - \frac{1}{3}\sin\theta}$. What is $h + k$?

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#25 Pre-calculus - Hustle
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Evaluate: $\prod_{k=1}^9 \left(1 + \frac{1}{k}\right)$

Answer : _____

Round 1 2 3 4 5

#25 Pre-calculus - Hustle
MAΘ National Convention 2018

Evaluate: $\prod_{k=1}^9 \left(1 + \frac{1}{k}\right)$

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#25 Pre-calculus - Hustle
MAΘ National Convention 2018

Evaluate: $\prod_{k=1}^9 \left(1 + \frac{1}{k}\right)$

Answer : _____

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#25 Pre-calculus - Hustle
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