

#1 Algebra II – Hustle
MAΘ National Convention 2025

If $f(x)=3x^2-1$ and $g(x)=x^3+1$, find $f(g(f(g(g(-1)))))$.

Answer : _____

Round 1 2 3 4 5

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#2 Algebra II – Hustle
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The graph of $y = \frac{x^4 - 2x^3 - 5x + 5}{x^2 + x + 2}$ has a parabolic asymptote whose equation can be written in the form $y = ax^2 + bx + c$. Find the value of $-b^{a+c}$.

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#3 Algebra II – Hustle
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Let the three solutions to

$$\left| \begin{array}{cc} 2x^2 + 1 & 10 \\ x - 1 & x + 2 \end{array} \right| = 7x^2 + 9x + 20 \text{ be } a, b, \text{ and } c,$$

where $a < b < c$. What is the value of c ?

Answer : _____

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#4 Algebra II – Hustle
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The domain of $y = \log_{x-8}(x^2 - 4x - 21)$ can be written in the form $(a, b) \cup (c, d)$. Find the value of $a + b - c$.

Answer : _____

Round 1 2 3 4 5

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#5 Algebra II – Hustle
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If $\frac{7x-25}{x^2-7x+12} = \frac{A}{x-3} + \frac{B}{x-4}$, find the value of B^A .

Answer : _____

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#6 Algebra II – Hustle
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Find the value of x such that $x+2$ is the arithmetic mean of $4x+1$ and $x-9$.

Answer : _____

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#7 Algebra II – Hustle
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Find the remainder when $4x^4 - 8x^3 + 7x^2 - 5$ is
divided by $x + \frac{1}{2}$.

Answer : _____

Round 1 2 3 4 5

#7 Algebra II – Hustle
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#8 Algebra II – Hustle
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A circle has $(2, 2)$ and $(-4, -6)$ as the endpoints of a diameter. If the area of the circle is $A\pi$, find A .

Answer : _____

Round 1 2 3 4 5

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#9 Algebra II – Hustle
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Find the magnitude of $(10 + 24i)(8 - 6i)$, where $i = \sqrt{-1}$.

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#10 Algebra II – Hustle
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For what nonzero value of a does the equation $3^x a + 3^{1-x} = 3$ have a unique solution? Write your answer as a fraction in lowest terms.

Answer : _____

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#11 Algebra II – Hustle
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Find the coefficient of the sixth term in the expansion of $(x^2 - 1)^{12}$ when the terms are written in descending powers of x .

Answer : _____

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#12 Algebra II – Hustle
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How many grams of pure carbonic acid must be added to 180 grams of a solution that is 35% carbonic acid to produce a solution that is 50% carbonic acid?

Answer : _____

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#13 Algebra II – Hustle
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Find $f(7)$ if $f(x) = \frac{x^4 - 10x^2 + 9}{x^2 - 4x + 3}$.

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2025

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#14 Algebra II – Hustle
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Find the distance between the foci of

$$\frac{(x-7)^2}{9} + \frac{(y+3)^2}{25} = 1.$$

Answer : _____

Round 1 2 3 4 5

#14 Algebra II – Hustle
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#15 Algebra II – Hustle
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If $2^{-3x} = \frac{1}{1000}$, find the value of
 $2^x + 4\log_{100} 2^x$.

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Round 1 2 3 4 5

#15 Algebra II – Hustle
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#16 Algebra II – Hustle
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An airport shuttle service operates between an airport and downtown. It costs \$10 to ride the shuttle, and 300 people ride the shuttle each day. The shuttle company estimates that business will decrease by 15 passengers per day for each \$1 increase in fare. Find the fare that will maximize revenue.

Answer : _____

Round 1 2 3 4 5

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#17 Algebra II – Hustle
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The nonterminating decimal $0.06006006\dots$ can be written as a fraction $\frac{a}{b}$. Find the value of $a + b$ when the fraction is written in lowest terms.

Answer : _____

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#18 Algebra II – Hustle
MAΘ National Convention 2025

Find the sum of the coefficients in the quotient
of $\frac{6x^5 - x^4 - 32x^3 - 20x^2 + 5x + 8}{2x - 3}$.

Answer : _____

Round 1 2 3 4 5

#18 Algebra II – Hustle
MAΘ National Convention 2025

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#19 Algebra II – Hustle
MAΘ National Convention 2025

How many integer solutions (a, b, c, d) to $a + b + c + d = 25$ exist if $a \geq 1, b \geq 2, c \geq 3$, and $d \geq 4$?

Answer : _____

Round 1 2 3 4 5

#19 Algebra II – Hustle
MAΘ National Convention 2025

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#20 Algebra II – Hustle
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Find the x -intercept of $y = 3\log_8(x - 4) + 2$,
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Answer : _____

Round 1 2 3 4 5

#20 Algebra II – Hustle
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MAΘ National Convention 2025

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Round 1 2 3 4 5

#21 Algebra II – Hustle
MAΘ National Convention 2025

Find the value of $a+b+c$ if

$$\sum_{n=5}^{10} (3n^2 - 2n + 1) = \sum_{n=1}^6 (an^2 + bn + c).$$

Answer : _____

Round 1 2 3 4 5

#21 Algebra II – Hustle
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#22 Algebra II – Hustle
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The triangle with vertices $(2, 3)$, $(8, -1)$, and $(-2, x)$ has an area of 24 units^2 . The sum of all values of x for which this is true can be written in simplest terms as $\frac{a}{b}$. Find the value of $a + b$.

Answer : _____

Round 1 2 3 4 5

#22 Algebra II – Hustle
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#23 Algebra II – Hustle
MAΘ National Convention 2025

If $f(x) = x^4 - x^2 + ax + b$ and $f(1) = 2$ and $f(2) = 17$, find the product of the roots of function f .

Answer : _____

Round 1 2 3 4 5

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#24 Algebra II – Hustle
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How many real-number solutions are there for
 $x^4 + |x| = 10$?

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#25 Algebra II – Hustle
MAΘ National Convention 2025

The graphs of $x^2 - 3y^2 = 1$ and $2x + 3y = 7$ have an intersection in Quadrant IV. Find the sum of the coordinates of the point of intersection.

Answer : _____

Round 1 2 3 4 5

#25 Algebra II – Hustle
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