#### #1 Precalculus – Hustle MA⊕ National Convention 2015

Solve for x:  $|x|^2 - |x| - 2 = 4$ 

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#### #2 Precalculus - Hustle MA⊕ National Convention 2015

In how many ways can Jack plant three oak trees and six willow trees in a row if no two oak trees can be next to each other? Assume trees of the same type are indistinguishable.

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#### #3 Precalculus – Hustle MA⊕ National Convention 2015

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#### #5 Precalculus – Hustle MA⊕ National Convention 2015

$$\begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

Find 
$$a+b-(c+d)$$
.

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#### #6 Precalculus – Hustle MA⊕ National Convention 2015

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#### #7 Precalculus – Hustle MA⊕ National Convention 2015

$$\mathbf{u} = \mathbf{i} - \mathbf{k}$$

$$\mathbf{v} = 2\mathbf{i} + \mathbf{j} + 3\mathbf{k}$$

Find 
$$2(\mathbf{u} \cdot \mathbf{v})^2 + |\mathbf{u} \times \mathbf{v}|^2$$
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#### #8 Precalculus – Hustle MA⊕ National Convention 2015

Robert, Ryan, Jay, Case, and Theo are playing a dice game where the players roll one standard fair die. Robert starts, and they take turns in the aforementioned order. If the first person to roll a 5 or higher wins, what is the probability Jay wins?

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Round 1 2 3 4 5 Round 1 2 3 4 5

#### #9 Precalculus - Hustle MA⊕ National Convention 2015

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Round 1 2 3 4 5

#### #10 Precalculus - Hustle MA⊕ National Convention 2015

## Given $\cos x = \frac{3}{5}$ and that the terminal side of x lies within the first quadrant, evaluate: $3\sin^2 x + 8\tan^2 x + \csc^2 x + 25\sin^2 x + 3\cos^2 x$ $-8\sec^2 x - \cot^2 x$

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Answer	:	

Round 1 2 3 4 5

#### Answer : \_\_\_\_\_

#### Round 1 2 3 4 5

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Round 1 2 3 4 5

Answer:\_

#### #11 Precalculus - Hustle MA⊕ National Convention 2015

Let  $\theta$  be the smallest positive angle of counterclockwise rotation so that the major and minor axes of  $4x^2 + 4xy + 4y^2 + 2x + 7y + 1 = 0$  coincide with the x and y axes. Find  $\sin \theta$ .

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Answer	
AII3WCI	

Round 1 2 3 4 5

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#### #12 Precalculus - Hustle MA⊕ National Convention 2015

Given  $2f(x) + f\left(\frac{1}{x}\right) = x$ , find f(x) as a single fraction.

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Round 1 2 3 4 5

Round 1 2 3 4 5

Answer : \_\_\_\_\_

## #13 Precalculus - Hustle MA® National Convention 2015

Given  $(\log_a b)^{16} + (\log_b a)^{16} = 47$ , where a and b are real numbers with all logarithms defined, find  $(\log_a b)^6 + (\log_b a)^6$ .

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Answer	
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Round 1 2 3 4 5

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Round 1 2 3 4 5

Answer : \_\_\_\_\_

#### #14 Precalculus - Hustle MA⊕ National Convention 2015

What is the area enclosed by a regular 24-gon inscribed in a circle with radius 1?

#14 Precalculus - Hustle		
MAΘ National Convention 2	201	5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#### #15 Precalculus - Hustle MA⊕ National Convention 2015

Evaluate: 
$$\frac{\sin\left(\frac{\pi}{12}\right) + \cos\left(\frac{\pi}{12}\right)}{\sin^3\left(\frac{\pi}{12}\right) + \cos^3\left(\frac{\pi}{12}\right)}$$

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#### #16 Precalculus - Hustle MA⊕ National Convention 2015

Zach is struggling to figure out what |3+4i| equals and asks Will for help. If Will is always correct, what answer does he get?

#16 Precalculus - Hustle		
MA⊕ National Convention 2	201	5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#### #17 Precalculus – Hustle MA⊕ National Convention 2015

Find A such that

$$\sum_{n=1}^{\infty} \frac{1}{\sum_{i=0}^{n} \binom{n}{i}} = \ln(A)$$

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Round 1 2 3 4 5

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Round 1 2 3 4 5

## #18 Precalculus - Hustle MA⊕ National Convention 2015

Gabe makes a regular, convex polygon by connecting the roots of  $\chi^6 = 64$  when plotted on the complex plane. Find the area enclosed by this polygon.

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Answer :	
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Round 1 2 3 4 5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#### #19 Precalculus - Hustle MA⊕ National Convention 2015

# What is the distance between the polar coordinates $\left(3, -\frac{\pi}{12}\right)$ and $\left(4, \frac{\pi}{4}\right)$ ?

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Round 1 2 3 4 5

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Round 1 2 3 4 5

Answer : \_\_\_\_\_

#### #20 Precalculus - Hustle MA⊕ National Convention 2015

## Evaluate: $\lim_{x \to \infty} \left( \sqrt{x^2 + 3x} - \sqrt{x^2 - x} \right)$

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#### #21 Precalculus - Hustle MA⊕ National Convention 2015

If Ankit invests \$5 in a bank account with 5% interest compounded continuously, how long (in years) will it take for his money to grow to \$2015?

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Answer : \_\_\_\_\_

Answer : \_\_\_\_\_

Round 1 2 3 4 5

## #22 Precalculus - Hustle MA® National Convention 2015

Find the length of the longest altitude in a triangle with side lengths 7, 8, and 9.

#22 Precalculus - Hustle		
MA⊕ National Convention 2	201	5

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Answer:		

Round 1 2 3 4 5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#23 Precalculus - Hustle
MAΘ National Convention 2015
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Round 1 2 3 4 5

#### #24 Precalculus – Hustle MA⊕ National Convention 2015

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Round 1 2 3 4 5

## #25 Precalculus - Hustle MA® National Convention 2015

Find the maximum area of a triangle with sides of lengths  $\cos 15^{\circ}$  and  $\sin 15^{\circ}$ .

#25 Precalculus - Hustle	
MAΘ National Convention 2	015

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Answer:		

Round 1 2 3 4 5

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Round 1 2 3 4 5

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Answer : \_\_\_\_\_

Round 1 2 3 4 5