## #1 Pre-Calculus – Hustle MA@ National Convention 2007

Let *z* be a complex variable, there is a solution of  $z^6 = 1$  for which *z* is in the third quadrant (not on either axis) of the complex plane. What is this solution, expressed as a + bi? (where *a*, *b* are real and  $i = \sqrt{-1}$ )

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Answer :						Answer	Answer :							
Round	1	2	3	4	5	Round	1	2	3	4	5			

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#### #2 Pre-Calculus – Hustle MA@ National Convention 2007

Divide,  $\frac{3+2i}{1-3i}$ . Express your answer as a + bi, (where a, b are real and  $i = \sqrt{-1}$ ).

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#### **#3 Pre-Calculus – Hustle MAO** National Convention 2007

Evaluate  $\left(e^3\right)^{\ln 2} \cdot \ln\left(\frac{\sqrt{e}}{e^2}\right)$ 

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Round 1 2 3 4 5

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

Round 1 2 3 4 5

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Evaluate 
$$(e^3)^{\ln 2} \cdot \ln\left(\frac{\sqrt{e}}{e^2}\right)$$

Answer	:	
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Round 1 2 3 4 5

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

Round 1 2 3 4 5

Evaluate  $(e^3)^{\ln 2} \cdot \ln\left(\frac{\sqrt{e}}{e^2}\right)$ 

# #4 Pre-Calculus – Hustle MA© National Convention 2007

What is the product of the solutions to  $\sin(2x) - \sin(x) = 0$  on the interval  $x \in (0, 2\pi]$ ?

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

# #5 Pre-Calculus – Hustle MA@ National Convention 2007

In the expansion of  $(3w - x + 2y + z)^7$ what is the coefficient of the  $wxy^2z^3$ term?

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

Round 1 2 3 4 5

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

Round 1 2 3 4 5

# #6 Pre-Calculus – Hustle MA@ National Convention 2007

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Answer :						Answe	r:_						
Round	1	2	3	4	5	Round	1	2	2	3	4	5	

Let  $a = \log_5 3$ , what is  $3^{\left(\frac{1}{a}\right)}$ ?

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

Round 1 2 3 4 5

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

#8 Pre-Calculus – Hustle MA© National Convention 2007

Evaluate: 
$$\cos^2\left(\frac{\pi}{12}\right) + \cos^2\left(\frac{5\pi}{12}\right)$$

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Answer :						Answer	Answer :					
Round	1	2	3	4	5	Round	1	2	3	4	5	

## #9 Pre-Calculus – Hustle MA© National Convention 2007

Let  $r_1, r_2, r_3, r_4$  be the roots of the equation  $f(x) = 4x^4 - 2x^3 + 7x^2 + x - 19$ .

What is the sum of the roots taken two at a time?

(i.e.  $r_1r_2 + r_1r_3 + r_1r_4 + r_2r_3 + r_2r_4 + r_3r_4$ )

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Answer	:		
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Round 1 2 3 4 5

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

# #10 Pre-Calculus – Hustle MA© National Convention 2007

What is the largest solution to  $4^x - 5 \cdot 2^x + 6 = 0$ ? Simplify your answer.  $(c \log_b a \text{ is simplified when } a, b > 0$ , b is as small as possible and a is not a power of an integer).

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

#### #11 Pre-Calculus – Hustle MA© National Convention 2007

Evaluate: 
$$\sum_{k=1}^{23} \left( \frac{1}{k} - \frac{1}{k+1} \right)$$

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Round 1 2 3 4 5

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

Round 1 2 3 4 5

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Answer	:	
	٠	

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

Round 1 2 3 4 5

## #12 Pre-Calculus – Hustle MA© National Convention 2007

Evaluate:  $(1-i)^7$  and express your answer in the form a + bi, (where *a*, *b* are real and  $i = \sqrt{-1}$ ).

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Answer	:					Answei	Answer :								
Round	1	2	3	4	5	Round	1	2	3	4	5				

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Answer :	
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Round 1 2 3 4 5

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

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

Round 1 2 3 4 5

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

# #14 Pre-Calculus – Hustle MA© National Convention 2007

Let the roots of  $f(x) = x^3 - 6x^2 + 11x - 6$ be a, b, c where  $a \le b \le c$ , what is 100a + 10b + c?

# #14 Pre-Calculus – Hustle MA© National Convention 2007

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Answer :						Answer :									
Round	1	2	3	4	5	Round	1	2	3	4	5				

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Answer :						Answer	Answer :								
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### **#15 Pre-Calculus – Hustle MAO** National Convention 2007

Let 
$$A = \begin{pmatrix} 2 & 3 \\ 0 & -1 \end{pmatrix}$$
 and  $B = A^4$ , what

is the determinant of *B*?

## **#15 Pre-Calculus – Hustle MAO** National Convention 2007

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

## #16 Pre-Calculus – Hustle MA© National Convention 2007

What is the y-intercept of the asymptote with a positive slope of the hyperbola

$$\frac{(x-2)^2}{4} - \frac{(y-1)^2}{9} = 1?$$

## #16 Pre-Calculus – Hustle MA@ National Convention 2007

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Round 1 2 3 4 5

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

Round 1 2 3 4 5

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Answer	:					Answe	Answer :								
Round	1	2	3	4	5	Round	1	2	3	4	5				

# #17 Pre-Calculus – Hustle MA© National Convention 2007

What is the area of the region enclosed by  $3x^2 + y^2 + 12x + 6y = 15$ ?

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

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Answer :
Round 1 2 3 4 5

Evaluate: 
$$\sum_{n=1}^{\infty} n \cdot 2^{-n}$$

## #18 Pre-Calculus – Hustle MA© National Convention 2007

Evaluate: 
$$\sum_{n=1}^{\infty} n \cdot 2^{-n}$$

Round 1 2 3 4 5

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

Round 1 2 3 4 5

# #18 Pre-Calculus – Hustle MA© National Convention 2007

Evaluate:  $\sum_{n=1}^{\infty} n \cdot 2^{-n}$ 

# #18 Pre-Calculus – Hustle MA© National Convention 2007

Evaluate: 
$$\sum_{n=1}^{\infty} n \cdot 2^{-n}$$

Answer :						Answei	Answer :							
Round	1	2	3	4	5	Round	1	2	3	4	5			

# #19 Pre-Calculus – Hustle MA@ National Convention 2007

In triangle ABC, AB = 4, BC = 5,  $\cos(B) = 1/8$ . What is the length of  $\overline{AC}$ ?

# #19 Pre-Calculus – Hustle MA© National Convention 2007

In triangle ABC, AB = 4, BC = 5,  $\cos(B) = 1/8$ . What is the length of  $\overline{AC}$ ?

Answer :						Answer					
Round	1	2	3	4	5	Round	1	2	3	4	5

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

Round 1 2 3 4 5

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

# #20 Pre-Calculus – Hustle MA© National Convention 2007

What is the determinant of

- $\begin{pmatrix} 1 & 2 & 3 & 4 \end{pmatrix}$
- 0 2 3 4 ?
- 0 0 3 4
- $\begin{pmatrix} 0 & 0 & 0 & 4 \end{pmatrix}$

# #20 Pre-Calculus – Hustle MA© National Convention 2007

What is the determinant of

 $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 2 & 3 & 4 \\ 0 & 0 & 3 & 4 \\ 0 & 0 & 0 & 4 \end{pmatrix} ?$ 

Answer :						Answe					
Round	1	2	3	4	5	Round	1	2	3	4	5

# #20 Pre-Calculus – Hustle MA© National Convention 2007

What is the determinant of

 $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 2 & 3 & 4 \\ 0 & 0 & 3 & 4 \\ 0 & 0 & 0 & 4 \end{pmatrix} ?$ 

# #20 Pre-Calculus – Hustle MA@ National Convention 2007

What is the determinant of

(1)	2	3	4	
0	2	3	4	2
0	0	3	4	•
0	0	0	4)	

				Answer :								
Answer	:					Round	1	2	3	4	5	
Round	1	2	3	4	5							

# #21 Pre-Calculus – Hustle MA© National Convention 2007

What are all values of x for which the inequality,  $|x^2 - 1| \le |x^2 + 2x + 1|$ , holds? Please express your answer in set form i.e.  $\{x : a < x < b \lor x > c\}$ .

# #21 Pre-Calculus – Hustle MAO National Convention 2007

What are all values of x for which the inequality,  $|x^2 - 1| \le |x^2 + 2x + 1|$ , holds? Please express your answer in set form i.e.  $\{x : a < x < b \lor x > c\}$ .

Answer	:					Answei	Answer :						
Round	1	2	3	4	5	Round	1	2	3	4	5		

#### #21 Pre-Calculus – Hustle MAQ National Convention 2007

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Answer :						Answei	Answer :							
Round	1	2	3	4	5	Round	1	2	3	4	5			

# #22 Pre-Calculus – Hustle MA© National Convention 2007

Given a key ring and 5 symmetric, different colored 'keys', in how many distinct ways can the keys be arranged on the key ring?

# #22 Pre-Calculus – Hustle MAO National Convention 2007

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Answer :						Answei							
Round	1	2	3	4	5	Round	1	2	3	4	5		

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Answer :						Answer	:				
Round	1	2	3	4	5	Round	1	2	3	4	5

# #23 Pre-Calculus – Hustle MA© National Convention 2007

What is the distance between the plane x + 2y + 3z + 4 = 0 and the point (1, 1, 1)?

# #23 Pre-Calculus – Hustle MA© National Convention 2007

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Answer :						Answei							
Round	1	2	3	4	5	Round	1	2	3	4	5		

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

Round 1 2 3 4 5

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

# #24 Pre-Calculus – Hustle MA@ National Convention 2007

What is the probability of rolling an odd number as the sum of two standard dice?

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Answer :						Answer :					
Dound	1	2	2	4	5	Dound	1	2	2	4	5
Kouna	T	4	3	4	3	Koulla	I	4	3	4	3

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Answer	:	
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Round 1 2 3 4 5

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

## **#25 Pre-Calculus – Hustle MAO** National Convention 2007

Let  $u = \langle -2, 3, 1 \rangle$  and  $v = \langle 4, -3, -2 \rangle$ , what is  $(u \times v) \cdot u$ ?

## **#25 Pre-Calculus – Hustle MAO** National Convention 2007

Let  $u = \langle -2, 3, 1 \rangle$  and  $v = \langle 4, -3, -2 \rangle$ , what is  $(u \times v) \cdot u$ ?

Answer :					Answei	Answer :						
Round	1	2	3	4	5	Round	1	2	3	4	5	

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Answer :						Answer	<b>Answer</b> :						
Round	1	2	3	4	5	Round	1	2	3	4			