#1 Precalculus-Hustle
MAΘ National Convention 2014

$$\frac{\sin\left(\frac{\pi}{3}+\frac{\pi}{4}\right)}{\cos\left(\frac{\pi}{2}-\frac{\pi}{6}\right)} =$$

Answer:_____
Round: 1   2   3   4   5

#2 Precalculus-Hustle
MAΘ National Convention 2014

$$\frac{2\tan\left(\frac{\pi}{8}\right)}{1+\tan^2\left(\frac{\pi}{8}\right)} =$$

Answer:_____
Round: 1   2   3   4   5

#3 Precalculus-Hustle
MAΘ National Convention 2014

Evaluate: $\left(e^{\frac{i\pi}{3}} - e^{-\frac{i\pi}{3}}\right)/4$

Answer:_____
Round: 1   2   3   4   5

#4 Precalculus-Hustle
MAΘ National Convention 2014

Evaluate: $\left(\cos\left(\frac{3\pi}{4}\right) + i\sin\left(\frac{3\pi}{4}\right)\right)^6$

Answer:_____
Round: 1   2   3   4   5

#5 Precalculus-Hustle
MAΘ National Convention 2014
A hyperbola has the equation:

$$\frac{(x-4)^2}{64} - \frac{(y-2)^2}{36} = 1$$

The foci can be written as (-a,b), (c,d). Find the least common multiple of a,b,c,d.

Answer:_____
Round: 1   2   3   4   5

#6 Precalculus-Hustle
MAΘ National Convention 2014
Jack ties a string of length 10cm between 2 point like nails separated by 8cm. He pulls the string taunt and traces a figure so that the length of the string from one nail, to Jack's pencil to the other nail is a constant 10cm. What is the area of this figure?

Answer:_____
Round: 1   2   3   4   5

#7 Precalculus-Hustle
MAΘ National Convention 2014
In ΔABC, where a is the side length opposite $\angle A$, etc. , a=6, b=10, $\angle C = 2\tan^{-1}\sqrt{3}$. What is the length of c?

Answer:_____
Round: 1   2   3   4   5

#8 Precalculus-Hustle
MAΘ National Convention 2014
What is the distance between any 2 of the 3$^{\text{rd}}$ roots of $\frac{\sqrt{3}}{2}\cos\left(\frac{\pi}{8}\right) + \frac{i}{2}\sin\left(\frac{\pi}{8}\right)$ in the complex plane?

Answer:_____
Round: 1   2   3   4   5

#9 Precalculus-Hustle
MAΘ National Convention 2014
The equation $x^2 + 2x + y^2 - 6y + 5 = 0$ can best be described by what type of conic section?

Answer:_____
Round: 1   2   3   4   5

#10 Precalculus-Hustle
MAΘ National Convention 2014
$$\left(1 - \sqrt{3}i\right)^{12}$$

Answer:_____
Round: 1   2   3   4   5

#11 Precalculus-Hustle
MAΘ National Convention 2014
$$\lim_{x \to \infty} \frac{\sum_{n=3}^{n=10} \binom{n}{n-2} x^{n-1}}{\sum_{n=1}^{n=11} n! \; x^{10-n}} =$$

Answer:_____
Round: 1   2   3   4   5

#12 Precalculus-Hustle
MAΘ National Convention 2014
Find the number of asymptotes in the equation
$$y = \frac{x^4 - 3x^3 - 23x^2 - 33x - 14}{x^3 + 6x^2 + 9x + 4}$$

Answer:_____
Round: 1   2   3   4   5

#13 Precalculus-Hustle
MAΘ National Convention 2014
Find the larger value of x which makes the following matrix singular:
$$\begin{bmatrix} 5 & 1 & 3 \\ 4 & 2 & x \\ 0 & x & -1 \end{bmatrix}$$

Answer:_____
Round: 1 2 3 4 5

#14 Precalculus-Hustle
MAΘ National Convention 2014
What is the magnitude of the cross product:
$$\langle 1,4,-4 \rangle \times \langle -2,3,2 \rangle$$

Answer:_____
Round: 1 2 3 4 5

#15 Precalculus-Hustle
MAΘ National Convention 2014
Six single-letter blocks spell COFFEE when lined up properly. Marshall, a not too smart chimp, plays with the blocks and lines them up in a row. What is the probability Marshall will make the blocks spell COFFEE?

Answer:_____
Round: 1 2 3 4 5

#16 Precalculus-Hustle
MAΘ National Convention 2014
If vectors **a** = <1,0,3> and **b** = <-2,2,4>, find:
$$\frac{\|a\|^2 - \|b\|^2}{\|a-b\|^2}$$

Answer:_____
Round: 1 2 3 4 5

What is the period of the function $\sin^4(2x)$?

Answer:_____
Round: 1   2   3   4   5

If $a_n = a_{n-1} + 6a_{n-2}$, and $a_0 = 0, a_1 = 5$, then a_n can also be written as the sum $x^n + y^n(-1)^{n+1}$, where x and y are positive, real numbers. What is the average of x and y?

Answer:_____
Round: 1   2   3   4   5

Simplify: $\dfrac{(3+2i)(-1+i)}{(5+i)(2i)}$

Answer:_____
Round: 1   2   3   4   5

What is the eccentricity of the conic section:
$$r = \frac{5}{8 + 2\cos(\theta)}$$

Answer:_____
Round: 1   2   3   4   5

#21 Precalculus-Hustle
MAΘ National Convention 2014
In the expansion of $(x + 3y)^7$, find the coefficient of the $x^a y^b$ term, where a and b are both prime numbers and a>b.

Answer:_____
Round: 1   2   3   4   5

#22 Precalculus-Hustle
MAΘ National Convention 2014
Find the area of the quadrilateral defined by the points: (-2,-2), (5,3), (3,-2), (-3,1).

Answer:_____
Round: 1   2   3   4   5

#23 Precalculus-Hustle
MAΘ National Convention 2014
Find y/x if

$$\frac{x}{3} + \frac{y}{4} = 0$$
$$\frac{x}{2} - \frac{y}{2} = 7$$

Answer:_____
Round: 1   2   3   4   5

#24 Precalculus-Hustle
MAΘ National Convention 2014
Find $\tan(75°)$

Answer:_____
Round: 1   2   3   4   5

Find the product of the roots of $y=\sin\left(\frac{3x}{4}\right)$

between $-5\pi \leq x \leq 5\pi$

Answer:_____
Round: 1   2   3   4   5