#1 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{h\to 0} \left(\frac{1}{h} \int_{2}^{2+h} \sin(x^2) dx \right)$

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Answer:	
11113 W C 1 .	

Round 1 2 3 4 5

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Round 1 2 3 4 5

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Answer : ______

Answer : _____

Round 1 2 3 4 5

#2 Calculus - Hustle MA⊕ National Convention 2015

At each point (x,y), the slope of y = g(x) is $3x^2(y-3)$. If g(0) = 4, find g(1).

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Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

#2 Calculus – Hustle MA⊕ National Convention 2015

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Answer : ______

Answer : _____

Round 1 2 3 4 5

#3 Calculus – Hustle MA⊕ National Convention 2015

Suppose
$$x > -1$$
. If $f(x) = x^2 + 2x - 8$ and $g(x)$ is the inverse of $f(x)$, calculate $\lim_{x \to 0} \frac{f(g(x)) - x}{x}$.

#3 Calculus - Hustle MA⊕ National Convention 2015

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Answer	
Allowel	

Round 1 2 3 4 5

Round 1 2 3 4 5

#3 Calculus – Hustle MA® National Convention 2015

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Answer:_

#4 Calculus – Hustle MA⊕ National Convention 2015

 $\sqrt{5}$ is the positive root of the function $f(x)=x^2-5$. Using Newton's method with $x_0=1$, approximate this positive root by computing the value of x_2 .

#4 Calculus – Hustle MA⊕ National Convention 2015

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Answer	:	
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Round 1 2 3 4 5

#4 Calculus - Hustle MA⊕ National Convention 2015

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Round 1 2 3 4 5

#4 Calculus – Hustle MA⊕ National Convention 2015

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Answer : _____

Answer : _____

Round 1 2 3 4 5

#5 Calculus - Hustle
MA⊚ National Convention 2015
Calculate the <i>normal</i> slope of the

Calculate the *normal* slope of the function $y = x^{x^x}$ evaluated at x = 1.

#5 Calculus - Hustle MA⊕ National Convention 2015

Calculate the *normal* slope of the function $y = x^{x^x}$ evaluated at x = 1.

A		
Answer	:	

Round 1 2 3 4 5

#5 Calculus - Hustle MA⊕ National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#5 Calculus - Hustle MA® National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#6 Calculus - Hustle
MA⊕ National Convention 2015
Determine the area enclosed by the
inner loop of $r = 1 + 2\cos q$.

#6 Calculus - Hustle MA⊕ National Convention 2015

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Answer			
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Round 1 2 3 4 5

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Determine the area enclosed by the inner loop of $r = 1 + 2\cos q$.

Answer : _____

Round 1 2 3 4 5

#6 Calculus - Hustle MA® National Convention 2015

Determine the area enclosed by the inner loop of $r = 1 + 2\cos q$.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#7 Calculus – Hustle MA⊕ National Convention 2015

If
$$x = 2t^3 - 1$$
 and $y = t^4$, then $\frac{d^2y}{dx^2}\Big|_{t=1} = \frac{1}{2}$

#7 Calculus – Hustle MA⊕ National Convention 2015

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Answer	
Allowel	

Round 1 2 3 4 5

#7 Calculus - Hustle MA® National Convention 2015

If
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Answer : ______

Round 1 2 3 4 5

#7 Calculus – Hustle MA⊗ National Convention 2015

If
$$x = 2t^3 - 1$$
 and $y = t^4$, then $\frac{d^2y}{dx^2}\Big|_{t=1} = \frac{1}{2}$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#8 Calculus – Hustle MA⊕ National Convention 2015

Evaluate: $\int_0^1 \frac{dx}{x^2 - 2x + 2}$

#8 Calculus – Hustle MA⊕ National Convention 2015

Evaluate: $\int_0^1 \frac{dx}{x^2 - 2x + 2}$

Answer : _____

Round 1 2 3 4 5

#8 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\int_0^1 \frac{dx}{x^2 - 2x + 2}$

Answer : _____

Round 1 2 3 4 5

#8 Calculus - Hustle MA® National Convention 2015

Evaluate: $\int_0^1 \frac{dx}{x^2 - 2x + 2}$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#9 Calculus – Hustle MA⊕ National Convention 2015	#9 Calculus – Hustle MA⊕ National Convention 2015
What positive number exceeds its	What positive number exceeds its
square by the greatest amount?	square by the greatest amount?
Answer :	Answer :
Round 1 2 3 4 5	Round 1 2 3 4 5
#9 Calculus – Hustle	#9 Calculus – Hustle
MA® National Convention 2015	MA® National Convention 2015
What positive number exceeds its square by the greatest amount?	What positive number exceeds its square by the greatest amount?

Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

Answer : _____

#10 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{x\to 0} (1+3x)^{-2/x}$

#10 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{x\to 0} (1+3x)^{-2/x}$

Answer : _____

Round 1 2 3 4 5

#10 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{x\to 0} (1+3x)^{-\frac{2}{x}}$

Answer : _____

Round 1 2 3 4 5

#10 Calculus - Hustle MA® National Convention 2015

Evaluate: $\lim_{x\to 0} (1+3x)^{-\frac{2}{x}}$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#11 Calculus - Hustle MA⊕ National Convention 2015

If
$$y = \left(\frac{(t+1)(t-1)}{(t-2)(t+3)}\right)$$
, evaluate $\frac{dy}{dt}$ at $t=3$.

#11 Calculus - Hustle MA⊕ National Convention 2015

If
$$y = \left(\frac{(t+1)(t-1)}{(t-2)(t+3)}\right)$$
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Answer	
Allowel	

Round 1 2 3 4 5

#11 Calculus – Hustle MA⊕ National Convention 2015

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Round 1 2 3 4 5

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If
$$y = \left(\frac{(t+1)(t-1)}{(t-2)(t+3)}\right)$$
, evaluate $\frac{dy}{dt}$ at $t=3$.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#12 Calculus - Hustle MA⊕ National Convention 2015

Find the volume of the solid resulting by revolving about the *y*-axis the region bounded by the *x*-axis and $y = (x - 1)(x - 3)^2$ between x = 1 and x = 3.

#12 Calculus - Hustle MA⊚ National Convention 2015

Find the volume of the solid resulting by revolving about the *y*-axis the region bounded by the *x*-axis and $y = (x - 1)(x - 3)^2$ between x = 1 and x = 3.

Answer	
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Round 1 2 3 4 5

#12 Calculus - Hustle MA® National Convention 2015

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Round 1 2 3 4 5

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Answer : _____

Answer : _____

Round 1 2 3 4 5

#13 Calculus - Hustle MA⊕ National Convention 2015

A spherical raindrop accumulates moisture at a rate numerically equal to twice its surface area. Find the rate at which the radius is increasing as the raindrop falls (in units/sec).

#13 Calculus - Hustle MA⊕ National Convention 2015

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Answer		

Round 1 2 3 4 5

#13 Calculus - Hustle MA® National Convention 2015

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Round 1 2 3 4 5

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Answer : ______

Answer : _____

Round 1 2 3 4 5

#14 Calculus - Hustle MA® National Convention 2015

Find the value of $\frac{dy}{dx}\Big|_{(x,y)=(2,2)}$ $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}$.

$$y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}} .$$

#14 Calculus - Hustle MA® National Convention 2015

Find the value of
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$$y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}} .$$

Answer : _____

Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

#14 Calculus - Hustle MA® National Convention 2015

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$$y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}.$$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#15 Calculus - Hustle MA© National Convention 2015

Evaluate: $\int_0^{\pi/4} \sqrt{1 + \cos 4x} dx$

#15 Calculus – Hustle MA⊕ National Convention 2015

Evaluate: $\int_0^{\pi/4} \sqrt{1 + \cos 4x} dx$

Answer:	
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Round 1 2 3 4 5

#15 Calculus – Hustle MA⊖ National Convention 2015

Evaluate: $\int_0^{\pi/4} \sqrt{1 + \cos 4x} dx$

Answer : _____

Round 1 2 3 4 5

#15 Calculus - Hustle MA® National Convention 2015

Evaluate: $\int_0^{\pi/4} \sqrt{1 + \cos 4x} dx$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#16 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{n\to\infty} \sum_{i=0}^{n-1} \frac{1}{\sqrt{n^2-i^2}}$

#16 Calculus - Hustle MA⊕ National Convention 2015

Evaluate:
$$\lim_{n\to\infty} \sum_{i=0}^{n-1} \frac{1}{\sqrt{n^2 - i^2}}$$

_	
Answer	
Allowel	

Round 1 2 3 4 5

#16 Calculus – Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{n\to\infty} \sum_{i=0}^{n-1} \frac{1}{\sqrt{n^2-i^2}}$

Answer : _____

Round 1 2 3 4 5

#16 Calculus - Hustle MA® National Convention 2015

Evaluate: $\lim_{n\to\infty}\sum_{i=0}^{n-1}\frac{1}{\sqrt{n^2-i^2}}$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#17 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{n\to\infty} \left(-\frac{n!}{e^{n^2}}\right)$

#17 Calculus – Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{n\to\infty} \left(-\frac{n!}{e^{n^2}}\right)$

Answer	:	

Round 1 2 3 4 5

#17 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{n\to\infty} \left(-\frac{n!}{e^{n^2}}\right)$

Answer : _____

Round 1 2 3 4 5

#17 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\lim_{n\to\infty} \left(-\frac{n!}{e^{n^2}}\right)$

Answer : ______

Answer : _____

Round 1 2 3 4 5

#18 Calculus - Hustle MA⊕ National Convention 2015

Find the radius of convergence of the series

$$\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} \cdot 3^n}$$

#18 Calculus - Hustle MA⊕ National Convention 2015

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$$\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} \cdot 3^n}$$

Answer:		

Round 1 2 3 4 5

#18 Calculus - Hustle MA® National Convention 2015

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$$\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} \cdot 3^n}$$

Answer : _____

Round 1 2 3 4 5

#18 Calculus - Hustle MA® National Convention 2015

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$$\sum_{n=1}^{\infty} \frac{x^n}{n \sqrt{n} \cdot 3^n}$$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#19 Calculus - Hustle

MA© National Convention 2015 If $f(x) = 2x^3 + Ax^2 + Bx + C$, where A, B, and Chas critical numbers of x = -1 and $x = \frac{1}{2}$, find

#19 Calculus - Hustle

MA© National Convention 2015 If $f(x) = 2x^3 + Ax^2 + Bx + C$, where A, B, and Chas critical numbers of x = -1 and $x = \frac{1}{2}$, find

Answer	•	
	• .	

Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

#19 Calculus - Hustle

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#19 Calculus - Hustle

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#20 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\int_{-2}^{3} \frac{|x|}{x} dx$

#20 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\int_{-2}^{3} \frac{|x|}{x} dx$

Answer : _____

Round 1 2 3 4 5

#20 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\int_{-2}^{3} \frac{|x|}{x} dx$

Answer : _____

Round 1 2 3 4 5

#20 Calculus - Hustle MA® National Convention 2015

Evaluate: $\int_{-2}^{3} \frac{|x|}{x} dx$

Answer : _____

Round 1 2 3 4 5

Answer : _____

#21 Calculus - Hustle	
MAO National Convention 2	2015

Find the coefficient for the x^3 term of the Maclaurin series for $f(x) = \sin(3x)$.

#21 Calculus - Hustle MA⊕ National Convention 2015

Find the coefficient for the x^3 term of the Maclaurin series for $f(x) = \sin(3x)$.

Answer : ______

Round 1 2 3 4 5

#21 Calculus - Hustle MA⊕ National Convention 2015

Find the coefficient for the x^3 term of the Maclaurin series for $f(x) = \sin(3x)$.

Answer : _____

Round 1 2 3 4 5

#21 Calculus - Hustle MA⊕ National Convention 2015

Find the coefficient for the x^3 term of the Maclaurin series for $f(x) = \sin(3x)$.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#22 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\frac{d}{dx} \left(\int_4^{x^3} e^{t^2} dt \right)$

#22 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\frac{d}{dx} \left(\int_4^{x^3} e^{t^2} dt \right)$

Answer : _____

Round 1 2 3 4 5

#22 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\frac{d}{dx} \left(\int_4^{x^3} e^{t^2} dt \right)$

Answer : _____

Round 1 2 3 4 5

#22 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\frac{d}{dx} \left(\int_4^{x^3} e^{t^2} dt \right)$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#23 Calculus - Hustle MA⊕ National Convention 2015

Find a + b for which $\lim_{x\to 0} \frac{\cos(ax) - b}{2x^2} = -1$, where a and b are positive integers.

#23 Calculus - Hustle MA⊕ National Convention 2015

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Round 1 2 3 4 5

#23 Calculus – Hustle

MA® National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#23 Calculus - Hustle MA⊕ National Convention 2015

Find a + b for which $\lim_{x \to 0} \frac{\cos(ax) - b}{2x^2} = -1$, where a and b are positive integers.

Answer : ______

Answer : _____

Round 1 2 3 4 5

#24 Calculus - Hustle

MA© National Convention 2015

Calculate $f'\left(\frac{\rho}{6}\right)$ where $f(x) = \frac{e^{ix} - e^{-ix}}{2i}$.

#24 Calculus - Hustle

MA© National Convention 2015

Calculate $f'\left(\frac{\rho}{6}\right)$ where $f(x) = \frac{e^{ix} - e^{-ix}}{2i}$.

Answer : _____

Round 1 2 3 4 5

#24 Calculus - Hustle MAΘ National Convention 2015

Calculate $f'\left(\frac{\rho}{6}\right)$ where $f(x) = \frac{e^{ix} - e^{-ix}}{2i}$.

Answer : _____

Round 1 2 3 4 5

#24 Calculus - Hustle MA⊚ National Convention 2015

Calculate $f'\left(\frac{p}{6}\right)$ where $f(x) = \frac{e^{ix} - e^{-ix}}{2i}$.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#25 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\int_{1}^{\infty} \frac{\ln x}{x^2} dx$

#25 Calculus - Hustle MA⊕ National Convention 2015

Evaluate: $\int_{1}^{\infty} \frac{\ln x}{x^{2}} dx$

Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle MA⊖ National Convention 2015

Evaluate: $\int_{1}^{\infty} \frac{\ln x}{x^{2}} dx$

Answer : _____

Round 1 2 3 4 5

#25 Calculus - Hustle MA® National Convention 2015

Evaluate: $\int_{1}^{\infty} \frac{\ln x}{x^{2}} dx$

Answer : _____

Answer : _____

Round 1 2 3 4 5