#1 Calculus - Hustle MA⊖ National Convention 2011

Let $f(x) = x^2$. Find a number c, $0 < c < \sqrt{3}$, such that f(c) is equal to the average value of f on the interval $\left[0, \sqrt{3}\right]$.

#1 Calculus – Hustle MA© National Convention 2011

Let $f(x) = x^2$. Find a number c, $0 < c < \sqrt{3}$, such that f(c) is equal to the average value of f on the interval $\left\lceil 0, \sqrt{3} \right\rceil$.

Answer	:	
	•	

Round 1 2 3 4 5

#1 Calculus – Hustle MA⊚ National Convention 2011

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Answer : _____

Round 1 2 3 4 5

#1 Calculus - Hustle MA® National Convention 2011

Let $f(x)=x^2$. Find a number c, $0 < c < \sqrt{3}$, such that f(c) is equal to the average value of f on the interval $\left\lceil 0, \sqrt{3} \right\rceil$.

Answer : _____

Round 1 2 3 4 5

Answer : _____

#2 Calculus – Hustle MA⊕ National Convention 2011

Find all values of *x* such that

$$\int_{0}^{x} (t^{3} - t) dt = \frac{1}{3} \int_{\sqrt{2}}^{x} (t - t^{3}) dt.$$

#2 Calculus – Hustle MA⊕ National Convention 2011

Find all values of *x* such that

$$\int_{0}^{x} \left(t^{3}-t\right) dt = \frac{1}{3} \int_{\overline{\Sigma}}^{x} \left(t-t^{3}\right) dt.$$

Answer : _____

Round 1 2 3 4 5

#2 Calculus - Hustle MA⊕ National Convention 2011

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Round 1 2 3 4 5

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Answer : _____

Answer : _____

Round 1 2 3 4 5

#3 Calculus – Hustle MA⊕ National Convention 2011

Find the value of the limit: $\lim_{x\to 0} \frac{\sin 5x - \sin 3x}{x}$

#3 Calculus – Hustle MA⊕ National Convention 2011

Find the value of the limit: $\lim_{x\to 0} \frac{\sin 5x - \sin 3x}{x}$

Answer : ______

Round 1 2 3 4 5

#3 Calculus - Hustle MA© National Convention 2011

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Round 1 2 3 4 5

#3 Calculus – Hustle MA⊕ National Convention 2011

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Answer : _____

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Round 1 2 3 4 5

#4 Calculus - Hustle MA⊕ National Convention 2011

Find
$$f'(\pi)$$
 if $f(x) = \frac{x \sin x}{1 + x^2}$.

#4 Calculus - Hustle MA⊕ National Convention 2011

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Answer : _____

Round 1 2 3 4 5

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$$f'(\pi)$$
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Answer : _____

Round 1 2 3 4 5

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$$f'(\pi)$$
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Answer : _____

Answer : _____

Round 1 2 3 4 5

#5 Calculus - Hustle	
MA® National Convention	2011

What is the rate of change of the volume of a cube with respect to its edge length *s*?

#5 Calculus – Hustle MA⊕ National Convention 2011

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Answer	i.

Round 1 2 3 4 5

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What is the rate of change of the volume of a cube with respect to its edge length *s*?

Answer : _____

Round 1 2 3 4 5

#5 Calculus - Hustle MA® National Convention 2011

What is the rate of change of the volume of a cube with respect to its edge length *s*?

Answer : _____

Answer : _____

Round 1 2 3 4 5

#6 Calculus – Hustle MA⊖ National Convention 2011

Find the *x*-values of the points on the graph of $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x + 1$ where the tangent is horizontal.

#6 Calculus - Hustle MA⊕ National Convention 2011

Find the *x*-values of the points on the graph of $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x + 1$ where the tangent is horizontal.

Ancwor:	
Answer:	

Round 1 2 3 4 5

#6 Calculus - Hustle MA® National Convention 2011

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Answer : _____

Round 1 2 3 4 5

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Answer : ______

Answer : _____

Round 1 2 3 4 5

#7 Calculus - Hustle MA⊕ National Convention 2011

Two functions f and g are both differentiable at x=0 and satisfy the equations $f(0)=\frac{2}{g(0)}$, f'(0)=2g'(0)=4g(0), and $g(0)+\frac{2}{f(0)}=8$. Let $h(x)=\frac{f(x)}{g(x)}$. Find the value of h'(0).

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Answer	:	
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Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

#7 Calculus – Hustle MA⊗ National Convention 2011

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Answer : _____

Round 1 2 3 4 5

#8 Calculus - Hustle MA⊕ National Convention 2011

Suppose a gas is pumped into a spherical balloon at a constant rate of 50 cubic centimeters per second. How fast is the radius of the balloon increasing, in centimeters per second, when the radius is 5 centimeters?

#8 Calculus - Hustle MA© National Convention 2011

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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

#8 Calculus - Hustle MA⊕ National Convention 2011

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Round 1 2 3 4 5

#9 Calculus – Hustle MA⊕ National Convention 2011

Find the value of the limit: $\lim_{x\to 3} \frac{x^3 - 27}{x - 3}$

#9 Calculus – Hustle MA⊚ National Convention 2011

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Answer	:	

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Round 1 2 3 4 5

#9 Calculus - Hustle MA® National Convention 2011

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Answer : _____

Answer : _____

Round 1 2 3 4 5

#10 Calculus – Hustle MA® National Convention 2011

A rectangular box with an open top is to be made from a square piece of cardboard whose sides are each 36 inches long by cutting equal small squares out of the corners and folding up the four flaps. For the box to have the greatest volume, what would be the length, in inches, of the sides of the small squares?

#10 Calculus - Hustle MA© National Convention 2011

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Ancrean	
Answer	

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 Round 1 2 3 4 5

#11 Calculus – Hustle MA® National Convention 2011

A freight train left the yards, and in t hours was at a distance $s(t) = t^3 - t^2 + 8t$ miles from the yards. Find the train's acceleration, in miles $/ hr^2$, at the point when it left the yards 90 minutes prior.

#11 Calculus - Hustle MA⊚ National Convention 2011

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Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

Answer : _____

#12 Calculus – Hustle MA⊕ National Convention 2011

Differentiate: $y = \ln \sqrt{\frac{x^2 - 5}{x^2 + 5}}$

#12 Calculus - Hustle MA® National Convention 2011

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$$y = \ln \sqrt{\frac{x^2 - 5}{x^2 + 5}}$$

Answer	:	

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Answer : _____

Round 1 2 3 4 5

#12 Calculus - Hustle MA® National Convention 2011

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$$y = \ln \sqrt{\frac{x^2 - 5}{x^2 + 5}}$$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#13 Calculus - Hustle MA⊕ National Convention 2011

#13 Calculus - Hustle MA⊕ National Convention 2011

Differentiate: $y = x^{x^2}$

Differentiate: $y = x^{x^2}$

Answer : _____

Round 1 2 3 4 5

#13 Calculus – Hustle MA⊕ National Convention 2011

Differentiate: $y = x^{x^2}$

Answer : _____

Round 1 2 3 4 5

#13 Calculus - Hustle MA© National Convention 2011

Differentiate: $y = x^{x^2}$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#14 Calculus - Hustle MA⊕ National Convention 2011

Find the equation, in point-slope form, of the normal line to the curve with equation $2x^3 = y^2$ at the point where x = 1 and y < 0.

#14 Calculus - Hustle MA® National Convention 2011

Find the equation, in point-slope form, of the normal line to the curve with equation $2x^3 = y^2$ at the point where x = 1 and y < 0.

Answer:	

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

#15 Calculus - Hustle MA⊕ National Convention 2011

Find the slope of the curve $x^2y^2 + x^3 - 2x - y^4 - 6y = 0$ at the point (0,0).

#15 Calculus – Hustle MA⊕ National Convention 2011

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Round 1 2 3 4 5

#15 Calculus - Hustle MA© National Convention 2011

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Answer : _____

Answer : _____

Round 1 2 3 4 5

#16 Calculus - Hustle MA⊕ National Convention 2011

Find
$$f'(x)$$
 if $f(x) = \frac{1}{\sqrt{1+x^2(x+\sqrt{1+x^2})}}$.

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#16 Calculus – Hustle MA® National Convention 2011

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Answer : _____

Round 1 2 3 4 5

#17 Calculus – Hustle MA⊕ National Convention 2011

Evaluate: $\lim_{n\to\infty} \left(\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n} \right)$

#17 Calculus – Hustle MA⊖ National Convention 2011

Evaluate: $\lim_{n\to\infty} \left(\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n} \right)$

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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

#18 Calculus – Hustle MA⊕ National Convention 2011

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#18 Calculus – Hustle MA® National Convention 2011

Evaluate: $\int (x+2)\sin(x^2+4x-6)dx$

Evaluate: $\int (x+2)\sin(x^2+4x-6)dx$

Answer : _____

Answer : _____

Round 1 2 3 4 5

Round 1 2 3 4 5

#18 Calculus - Hustle MA® National Convention 2011 #18 Calculus - Hustle MA⊕ National Convention 2011

Evaluate: $\int (x+2)\sin(x^2+4x-6)dx$

Evaluate: $\int (x+2)\sin(x^2+4x-6)dx$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#19 Calculus – Hustle MA⊕ National Convention 2011

Find the rational expression for y, given that

$$\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$$
 with $y = 1$ when $x = 0$.

#19 Calculus - Hustle MA⊖ National Convention 2011

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Round 1 2 3 4 5

#19 Calculus - Hustle MA© National Convention 2011

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Round 1 2 3 4 5

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 with $y=1$ when $x=0$.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#20 Calculus - Hustle MA⊕ National Convention 2011

Find the volume of the solid generated by revolving the region bounded by $y = e^{-x^2}$, y = 0, x = 0, and x = 1 about the *y*-axis.

#20 Calculus - Hustle MA® National Convention 2011

Find the volume of the solid generated by revolving the region bounded by $y = e^{-x^2}$, y = 0, x = 0, and x = 1 about the *y*-axis.

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#20 Calculus - Hustle MA® National Convention 2011

Find the volume of the solid generated by revolving the region bounded by $y = e^{-x^2}$, y = 0, x = 0, and x = 1 about the y-axis.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#21 Calculus - Hustle MA® National Convention 2011

Find the value of
$$\left. \frac{d^2 y}{dx^2} \right|_{t=\frac{\pi}{3}}$$
 where $x = t - \sin t$ and $y = 1 - \cos t$.

#21 Calculus - Hustle MA® National Convention 2011

Find the value of $\frac{d^2y}{dx^2}\Big|_{t=\frac{\pi}{2}}$ where $x=t-\sin t$ and $y=1-\cos t$.

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Answer : _____

Round 1 2 3 4 5

#21 Calculus - Hustle MA® National Convention 2011

Find the value of $\frac{d^2y}{dx^2}\Big|_{t=\frac{\pi}{2}}$ where $x = t - \sin t$ and $y=1-\cos t$.

Answer : _____

Answer : _____

Round 1 2 3 4 5

#22 Calculus - Hustle MA⊕ National Convention 2011

Find the area of the region bounded by the cardioid with equation $r = 2 + 2\cos\theta$.

#22 Calculus - Hustle	
MA MA National Convention 2	011

Find the area of the region bounded by the cardioid with equation $r = 2 + 2\cos\theta$.

_	
Answer	l .

Round 1 2 3 4 5

#22 Calculus – Hustle MA© National Convention 2011

Find the area of the region bounded by the cardioid with equation $r = 2 + 2\cos\theta$.

Answer : _____

Round 1 2 3 4 5

#22 Calculus - Hustle MA® National Convention 2011

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Answer : _____

Answer : _____

Round 1 2 3 4 5

#23 Calculus - Hustle MA⊕ National Convention 2011

Find the length of the arch of the cycloid curve $x = \theta - \sin \theta$, $y = 1 - \cos \theta$, between $\theta = 0$ and $\theta = 2\pi$.

#23 Calculus - Hustle MA⊕ National Convention 2011

Find the length of the arch of the cycloid curve $x = \theta - \sin \theta$, $y = 1 - \cos \theta$, between $\theta = 0$ and $\theta = 2\pi$.

Ancrean	
Answer	

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

#24 Calculus - Hustle	
MAΘ National Convention 2	011

Evaluate: $\int_{0}^{0} xe^{x} dx$

#24 Calculus – Hustle MA⊕ National Convention 2011

Evaluate: $\int_{-\infty}^{0} x e^{x} dx$

Answer : _____

Round 1 2 3 4 5

#24 Calculus – Hustle MA⊕ National Convention 2011

Evaluate: $\int_{-\infty}^{0} x e^{x} dx$

Answer : _____

Round 1 2 3 4 5

#24 Calculus - Hustle MA⊕ National Convention 2011

Evaluate: $\int_{0}^{0} xe^{x} dx$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#25 Calculus - Hustle	
MA® National Convention	2011

Find the coefficient of x^4 term in the Maclaurin expansion of $\ln(1+x)$.

#25 Calculus – Hustle MA⊕ National Convention 2011

Find the coefficient of x^4 term in the Maclaurin expansion of $\ln(1+x)$.

Answer : _____

Round 1 2 3 4 5

#25 Calculus - Hustle MA⊕ National Convention 2011

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Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle MA⊕ National Convention 2011

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Answer : _____

Answer : _____

Round 1 2 3 4 5