#1 Calculus - Hustle MA© National Convention 2016

Evaluate:

 $\lim_{x\to 0} x \cot 5x$

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Answer : _____

Round 1 2 3 4 5

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#2 Calculus – Hustle MA© National Convention 2016

Evaluate the following indefinite integral: $\int x \sec^2 x^2 dx$

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Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#3 Calculus – Hustle MA© National Convention 2016

Find the value of ab for a, b such that the following piece-wise function is continuous and differentiable on \mathbb{R} .

$$f(x) = \begin{cases} e^{-x^2} & x \le 1\\ ax+b & x > 1 \end{cases}$$

#3 Calculus – Hustle MA© National Convention 2016

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#4 Calculus – Hustle MA© National Convention 2016

Evaluate:

$$\lim_{x \to 0} \frac{2 - \ln(x + e^2)}{2x}$$

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Round 1 2 3 4 5

Answer : _____

#5 Calculus – Hustle MA© National Convention 2016

Use the Trapezoidal Rule with 4 uniform subdivisions to approximate the following integral:

$$\int_0^2 (2x^2 + 1)dx$$

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Round 1 2 3 4 5

#6 Calculus – Hustle MA© National Convention 2016

For some odd function f(x), we know $\int_{0}^{4} f(x)dx = 10 \text{ and } \int_{-2}^{0} f(x)dx = -4.$ Find the value of $\int_{-4}^{-2} f(x)dx$.

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#7 Calculus – Hustle MA© National Convention 2016

The position of some particle in the coordinate plane at time t is given by $x(t) = \ln(t)$ and $y(t) = e^{t^2}$. Find the particle's tangential velocity at t = 2.

#7 Calculus – Hustle MA© National Convention 2016

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#8 Calculus – Hustle MA© National Convention 2016

Let $h(x) = \frac{f(g(x))}{f(x)}$ where f and g are defined below. Find h'(1).

x	1	2	3
f(x)	3	0	1
g(x)	2	2	0
f'(x)	1	1	2
g'(x)	2	3	1

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#9 Calculus – Hustle MA© National Convention 2016

Use the linear approximation of $f(x) = \sqrt[4]{x}$ at x = 81 to approximate the value of $\sqrt[4]{75}$.

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Answer : _____

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#10 Calculus – Hustle MA© National Convention 2016

I pull apart opposite edges of a cube so that the length of its diagonal increases at a rate of 3cm/s. At what rate, in cm/s, does its surface area increase when the diagonal has length 3? (Assume that the solid maintains its cube shape).

#10 Calculus – Hustle MA© National Convention 2016

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#11 Calculus – Hustle MA© National Convention 2016

Find the value(s) guaranteed by the Mean Value Theorem for derivatives for the function $f(x) = x^3 - x$ on the interval [0, 2].

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#12 Calculus – Hustle MA_O National Convention 2016

Evaluate:

$$\lim_{x \to -\infty} \frac{\sqrt{x^2 + 4x + 4}}{2x + 4}$$

#12 Calculus – Hustle MA[®] National Convention 2016

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#13 Calculus – Hustle MA© National Convention 2016

Find the value of f'(2) given that $f(x) = x^{x^2}$

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#14 Calculus – Hustle MA© National Convention 2016

The growth of a population *P* is governed by the differential equation $\frac{dP}{dt} = kP(2000 - 5P)$. Find the value of $\lim_{t\to\infty} P(t)$.

#14 Calculus – Hustle MA© National Convention 2016

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Round 1 2 3 4 5

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#15 Calculus – Hustle MA© National Convention 2016

 $f(x) = x^3 - 3x^2 + x + 1$. Find the derivative of $f^{-1}(x)$ at the point $(4, f^{-1}(4))$.

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Round 1 2 3 4 5

Answer : _____

#16 Calculus – Hustle MA© National Convention 2016

Solve the integral:

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

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

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Round 1 2 3 4 5

Answer : _____

#17 Calculus – Hustle MA© National Convention 2016

A curve in the coordinate plane is described parametrically by $x(t) = t^3 + 1$ and $y(t) = 2t^2$. Find the length of the curve between (1,0) and (2,2).

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Round 1 2 3 4 5

Answer : _____

#18 Calculus – Hustle MA© National Convention 2016

Find f'(2) given

$$f(x) = \frac{(x+3)^2(x+1)}{(x-3)^2(x-1)}$$

#18 Calculus – Hustle MA© National Convention 2016

Find f'(2) given $(x+3)^2(x+3)^2$

$$f(x) = \frac{(x+3)^2(x+1)}{(x-3)^2(x-1)}$$

Answer : _____

Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

#18 Calculus – Hustle MA© National Convention 2016

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Answer : _____

Round 1 2 3 4 5

#19 Calculus – Hustle MA© National Convention 2016

Find the area enclosed by the curves f(x) = xand $g(x) = x^5$.

#19 Calculus – Hustle MA© National Convention 2016

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Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

#19 Calculus – Hustle MA© National Convention 2016

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#20 Calculus – Hustle MA© National Convention 2016

Find $\lim_{x\to\infty} f'(x)$ where

$$f(x) = \left(1 + \frac{1}{x}\right)^x$$

#20 Calculus – Hustle MA© National Convention 2016

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Answer : _____

Round 1 2 3 4 5

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Find
$$\lim_{x \to \infty} f'(x)$$
 where
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Answer : _____

Answer : _____

Round 1 2 3 4 5

#21 Calculus – Hustle MA© National Convention 2016

A radioactive substance decays at a rate directly proportional to the amount of the substance present. Initially there are 10g and there are 7.5g after an hour. What is the substance's half-life (in hours)?

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Round 1 2 3 4 5

Answer : _____

#22 Calculus – Hustle MA© National Convention 2016

Find the volume for the solid formed by rotating the first-quadrant portion of $f(x) = e^{-x}$ around the x axis.

#22 Calculus – Hustle MA© National Convention 2016

Find the volume for the solid formed by rotating the first-quadrant portion of $f(x) = e^{-x}$ around the x axis.

Answer	
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Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#23 Calculus – Hustle MA© National Convention 2016

Find the maximum of the profit function $P(x) = 10\sqrt{x} - x/3$ where x is the number of people that visit a shop per hour. Note that the capacity of the shop is 200 people/hour.

#23 Calculus – Hustle MA© National Convention 2016

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Answer :

Round 1 2 3 4 5

Answer : _____

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	:

Round 1 2 3 4 5

Answer : _____

#24 Calculus – Hustle MA© National Convention 2016

Evaluate:

$$\lim_{n \to \infty} \sum_{i=1}^n \frac{n}{n^2 + 3i^2}$$

#24 Calculus – Hustle MA© National Convention 2016

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Answer : _____

Round 1 2 3 4 5

Answer:_____ Round 1 2 3 4 5

#24 Calculus – Hustle MA© National Convention 2016

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Answer : _____

Round 1 2 3 4 5

Round 1 2 3 4 5

Answer : _____

#25 Calculus – Hustle MA© National Convention 2016

Find $F'(\pi/6)$ given

$$F(x) = \int_{\cos x}^{\sin x} (1 - t^2) \, dt$$

#25 Calculus – Hustle MA© National Convention 2016

Find $F'(\pi/6)$ given

$$F(x) = \int_{\cos x}^{\sin x} (1 - t^2) \, dt$$

Answer : _____

Round 1 2 3 4 5

Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle MA© National Convention 2016

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$$F(x) = \int_{\cos x}^{\sin x} (1 - t^2) dt$$

#25 Calculus – Hustle MA© National Convention 2016

Find
$$F'(\pi/6)$$
 given

$$F(x) = \int_{\cos x}^{\sin x} (1 - t^2) dt$$

Answer : _____

Round 1 2 3 4 5

Answer : _____