

Hustle Test #841 Calculus



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#1 Calculus – Hustle MA⊕ National Convention 2013

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Evaluate:

$$\lim_{x \to 0} \left(\frac{1}{x} - \frac{1}{\sin x} \right)$$

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$$\lim_{x\to 0} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$$

Answer : _____

Round 1 2 3 4 5

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#2 Calculus – Hustle MA⊕ National Convention 2013

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For the function $f(x) = x^3 + 2x + 5$,

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find the value of $(f^{-1})'(5)$.

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Answer : ______

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Round 1 2 3 4 5

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#2 Calculus - Hustle MA® National Convention 2013 #2 Calculus - Hustle MA® National Convention 2013

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#3 Calculus – Hustle MA⊕ National Convention 2013

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Evaluate:

$$\lim_{N \to \infty} \frac{1}{N} \sum_{j=1}^{N} \left(\frac{j}{N} \right)^4$$

Evaluate:

$$\lim_{N\to\infty}\frac{1}{N}\sum_{j=1}^N\left(\frac{j}{N}\right)^4$$

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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#4 Calculus – Hustle MA⊕ National Convention 2013

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Evaluate:

$$\frac{d}{dx}\int_{3}^{x^{3}}\sin(t^{2})\,dt$$

Evaluate:

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Round 1 2 3 4 5

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#4 Calculus – Hustle MA⊕ National Convention 2013

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Evaluate:

$$\frac{d}{dx}\int_{2}^{x^{3}}\sin(t^{2})\,dt$$

Evaluate:

$$\frac{d}{dx}\int_{3}^{x^{3}}\sin(t^{2})\,dt$$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#5 Calculus – Hustle MA⊕ National Convention 2013

Find the volume obtained by rotating the region enclosed by the graphs of y = x(5 - x) and y = 8 - x(5 - x) about the *y*-axis.

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Answer	•	

Round 1 2 3 4 5

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Round 1 2 3 4 5

#6 Calculus - Hustle MA⊕ National Convention 2013

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Evaluate:

$$\int_{1}^{\sqrt{3}} \frac{dx}{(\arctan x)(1+x^2)}$$

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Answer : _____

Round 1 2 3 4 5

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#6 Calculus - Hustle MA⊕ National Convention 2013 #6 Calculus - Hustle MA⊕ National Convention 2013

Evaluate:

$$\int_{1}^{\sqrt{3}} \frac{dx}{(\arctan x)(1+x^2)}$$

Evaluate:

$$\int_{-\infty}^{\sqrt{3}} \frac{dx}{(\arctan x)(1+x^2)}$$

Answer : _____

Answer : _____

Round 1 2 3 4 5

#7 Calculus – Hustle MA⊕ National Convention 2013

Find the area of the region inside the polar graph $r=2\cos\theta$, but outside the circle whose polar equation is r=1.

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#8 Calculus – Hustle MA⊕ National Convention 2013

An electric current, *I*, in amps, is given by

$$I = \cos(wt) + \sqrt{3}\sin(wt)$$

where $w \neq 0$ is a constant. What is the maximum value, in amps, of I?

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#9 Calculus – Hustle MA⊕ National Convention 2013

Find the slope of the tangent line to the plane curve

$$x^3 + 5x^2y + 2y^2 = 4y + 11$$

at (1,2). Express your answer as a common fraction.

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#10 Calculus – Hustle MA® National Convention 2013

Find the area between the cubic $y = x^3 - 10x$ and the line y = 6x on the interval $-4 \le x \le 4$.

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#11 Calculus - Hustle MA⊕ National Convention 2013

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$$\int (3x^2 \sin 4x + \ln x) \, dx$$

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#12 Calculus - Hustle MA⊕ National Convention 2013

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Find the limit:

$$\lim_{x \to 0} \frac{e^x - 1 - \ln(1+x)}{x^2}$$

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#13 Calculus – Hustle MA® National Convention 2013

A closed box in the shape of a right rectangular prism has a fixed surface area *A* and a square base with side *x*. In terms of *x* and *A*, what is the maximum volume of the box?

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#14 Calculus – Hustle MA® National Convention 2013

A jet needs to be flying 200 miles per hour in order to take off. If it can accelerate from 0 to 200 miles per hour in 30 seconds, how many miles long must the runway be?

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#15 Calculus - Hustle MA⊕ National Convention 2013

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Find the limit:

$$\lim_{x\to 0} \frac{1}{x} \ln\left(\frac{4+x}{4}\right)$$

Find the limit:

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#16 Calculus - Hustle MA⊕ National Convention 2013

Find the slope of the line *normal* to the graph of $y = 2\ln(\sec x)$ at $x = \frac{\pi}{4}$.

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#17 Calculus – Hustle MA® National Convention 2013

A point moves in a straight line so that its distance D at time $t \ge 0$ from a fixed point on the line is $D = 8t - 3t^2$. What is the total distance covered by the point between t = 1 and t = 2?

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Answer	

Round 1 2 3 4 5

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Round 1 2 3 4 5

#18 Calculus – Hustle MA® National Convention 2013

Let f be the function given by $f(x) = x^3 - 6x^2 + p$, where p is an arbitrary constant with respect to x and f. Find the value of p such that the average value of f over the closed-interval $-1 \le x \le 2$ is equal to 1.

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#19 Calculus – Hustle MA⊕ National Convention 2013

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Find $\frac{d^2y}{dx^2}$ for the parametric equations

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$$x = e^t + 3$$
 and $y = e^{2t} + 6e^t + 9$.

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Round 1 2 3 4 5

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Round 1 2 3 4 5

#20 Calculus - Hustle MA⊕ National Convention 2013

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Find the sum:

$$\sum_{n=0}^{\infty} \frac{3^n + 5}{4^n}$$

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Answer : _____

Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

#21 Calculus - Hustle MA⊕ National Convention 2013

Find the particular solution to the differential equation

$$\frac{dP}{dt} = 2P - 2Pt$$
, satisfying $P = 5$ when $t = 0$.

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Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

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#22 Calculus - Hustle MA⊕ National Convention 2013

Find the x-coordinate of the local minimum for the graph of

$$y = f(x) = x^3 - 9x^2 - 48x + 52.$$

#22 Calculus - Hustle MA⊕ National Convention 2013

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Answer : _____

Round 1 2 3 4 5

Answer : _____

#23 Calculus - Hustle MA⊕ National Convention 2013

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Evaluate:

$$\int \frac{x^3 - 7x^2 + 10x + 1}{x^2 - 7x + 10} dx$$

Evaluate:

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Answer : _____

Round 1 2 3 4 5

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Answer : _____

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Round 1 2 3 4 5

#24 Calculus - Hustle MA⊕ National Convention 2013

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Find the derivative of

$$f(x) = \ln\left(\frac{1 - \cos x}{1 + \cos x}\right)^4$$

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Round 1 2 3 4 5

#25 Calculus - Hustle MA⊕ National Convention 2013

#25 Calculus - Hustle MA⊕ National Convention 2013

Find the limit:

$$\lim_{x \to 1} \frac{x^x - x}{1 - x + \ln x}$$

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$$\lim_{x \to 1} \frac{x^x - x}{1 - x + \ln x}$$

Answer : _____

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