MU ALPHA THETA
NATIONAL CONVENTION
SAN DIEGO 2013

Hustle
Test #841
Calculus

MU ALPHA THETA
NATIONAL CONVENTION
SAN DIEGO 2013

Hustle
Test #841
Calculus

MU ALPHA THETA
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Hustle
Test #841
Calculus

MU ALPHA THETA
NATIONAL CONVENTION
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Hustle
Test #841
Calculus

#1 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

Answer : _____

Round 1 2 3 4 5

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#2 Calculus – Hustle
MAΘ National Convention 2013

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

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

Answer : ______________________

Round 1 2 3 4 5

#2 Calculus – Hustle
MAΘ National Convention 2013

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Answer : ______________________

Round 1 2 3 4 5

#3 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

Answer : _____

Round 1 2 3 4 5

#3 Calculus – Hustle
MAΘ National Convention 2013

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Answer : _____

Round 1 2 3 4 5

#4 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

Answer : _____

Round 1 2 3 4 5

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#5 Calculus – Hustle
MAΘ 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.

Answer : ______________________

Round 1 2 3 4 5

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MAΘ National Convention 2013

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Answer : ______________________

Round 1 2 3 4 5

#6 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#7 Calculus – Hustle
MAΘ 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 $r = 1$.

Answer : ______________________

Round 1 2 3 4 5

#7 Calculus – Hustle
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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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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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Round 1 2 3 4 5

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Answer : ______________________

Round 1 2 3 4 5

#8 Calculus – Hustle
MAΘ 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*?

Answer : _____

Round 1 2 3 4 5

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#9 Calculus – Hustle
MAΘ 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.

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#10 Calculus – Hustle
MAΘ National Convention 2013

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

Answer : _____

Round 1 2 3 4 5

#10 Calculus – Hustle
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Answer : _____

Round 1 2 3 4 5

#11 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

Answer : _____

Round 1 2 3 4 5

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#12 Calculus – Hustle
MAΘ National Convention 2013

Find the limit:

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

Answer : ______________________

Round 1 2 3 4 5

#12 Calculus – Hustle
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Find the limit:

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#13 Calculus – Hustle
MAΘ 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?

Answer : ________________________

Round 1 2 3 4 5

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Round 1 2 3 4 5

#14 Calculus – Hustle
MAΘ 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?

Answer : ______________________

Round 1 2 3 4 5

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MAΘ 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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Round 1 2 3 4 5

#15 Calculus – Hustle
MAΘ National Convention 2013

Find the limit:

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

Answer : ______________________

Round 1 2 3 4 5

#15 Calculus – Hustle
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Find the limit:

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Answer : ______________________

Round 1 2 3 4 5

#16 Calculus – Hustle
MAΘ National Convention 2013

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

Answer : _____

Round 1 2 3 4 5

#16 Calculus – Hustle
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#17 Calculus – Hustle
MAΘ National Convention 2013

A point moves in a straight line so that its distance D at time $t \geq 0$ 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 $t = 2$?

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2013

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Round 1 2 3 4 5

#18 Calculus – Hustle
MAΘ 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.

Answer : ______________________

Round 1 2 3 4 5

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MAΘ National Convention 2013

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Answer : ______________________

Round 1 2 3 4 5

#19 Calculus – Hustle
MAΘ National Convention 2013

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

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

Answer : ______________________

Round 1 2 3 4 5

#19 Calculus – Hustle
MAΘ National Convention 2013

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

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

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Round 1 2 3 4 5

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Answer : ______________________

Round 1 2 3 4 5

#20 Calculus – Hustle
MAΘ National Convention 2013

Find the sum:

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

Answer : _____

Round 1 2 3 4 5

#20 Calculus – Hustle
MAΘ National Convention 2013

Find the sum:

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

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Round 1 2 3 4 5

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#20 Calculus – Hustle
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$$\sum_{n=0}^{\infty} \frac{3^n + 5}{4^n}$$

Answer : _____

Round 1 2 3 4 5

#21 Calculus – Hustle
MAΘ National Convention 2013

Find the particular solution to the differential equation

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

Answer : _____

Round 1 2 3 4 5

#21 Calculus – Hustle
MAΘ 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

#21 Calculus – Hustle
MAΘ National Convention 2013

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

Answer : _____

Round 1 2 3 4 5

#21 Calculus – Hustle
MAΘ National Convention 2013

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

Answer : _____

Round 1 2 3 4 5

#22 Calculus – Hustle
MAΘ National Convention 2013

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

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

Answer : ______________________

Round 1 2 3 4 5

#22 Calculus – Hustle
MAΘ National Convention 2013

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

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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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MAΘ National Convention 2013

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

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Answer : ______________________

Round 1 2 3 4 5

#23 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

Answer : ______________________

Round 1 2 3 4 5

#23 Calculus – Hustle
MAΘ National Convention 2013

Evaluate:

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

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Answer : ______________________

Round 1 2 3 4 5

#24 Calculus – Hustle
MAΘ National Convention 2013

Find the derivative of

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

Answer : _____

Round 1 2 3 4 5

#24 Calculus – Hustle
MAΘ National Convention 2013

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

#24 Calculus – Hustle
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MAΘ National Convention 2013

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Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle
MAΘ National Convention 2013

Find the limit:

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

Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle
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