#1 Calculus – Hustle
MAΘ National Convention 2015

Evaluate: $\lim_{h\to 0}\left(\frac{1}{h}\int_2^{2+h}\sin\left(x^2\right)dx\right)$

Answer : _____

Round 1 2 3 4 5

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Answer : _____

Round 1 2 3 4 5

#2 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#2 Calculus – Hustle
MAΘ 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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MAΘ National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#3 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#3 Calculus – Hustle
MAΘ National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#4 Calculus – Hustle
MAΘ 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.

Answer : _____

Round 1 2 3 4 5

#4 Calculus – Hustle
MAΘ 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.

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$\sqrt{5}$ 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.

Answer : _____

Round 1 2 3 4 5

#5 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#5 Calculus – Hustle
MAΘ National Convention 2015

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

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#6 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#6 Calculus – Hustle
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#7 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#7 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

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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 2015

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

Answer : _____

Round 1 2 3 4 5

#8 Calculus – Hustle
MAΘ National Convention 2015

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Round 1 2 3 4 5

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MAΘ National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#8 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#9 Calculus – Hustle
MAΘ National Convention 2015

What positive number exceeds its square by the greatest amount?

Answer : _____

Round 1 2 3 4 5

#9 Calculus – Hustle
MAΘ National Convention 2015

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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MAΘ National Convention 2015

What positive number exceeds its square by the greatest amount?

Answer : _____

Round 1 2 3 4 5

#10 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#10 Calculus – Hustle
MAΘ National Convention 2015

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

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#11 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#11 Calculus – Hustle
MAΘ National Convention 2015

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

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Answer : _____

Round 1 2 3 4 5

#12 Calculus – Hustle
MAΘ 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 : _____

Round 1 2 3 4 5

#12 Calculus – Hustle
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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 $x = 3$.

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Answer : _____

Round 1 2 3 4 5

#13 Calculus – Hustle
MAΘ 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).

Answer : _____

Round 1 2 3 4 5

#13 Calculus – Hustle
MAΘ 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).

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Answer : _____

Round 1 2 3 4 5

#14 Calculus – Hustle
MAΘ National Convention 2015

Find the value of $\left.\frac{dy}{dx}\right|_{(x,y)=(2,2)}$ if

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

Answer : _____

Round 1 2 3 4 5

#14 Calculus – Hustle
MAΘ National Convention 2015

Find the value of $\left.\frac{dy}{dx}\right|_{(x,y)=(2,2)}$ if

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

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Round 1 2 3 4 5

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Find the value of $\left.\frac{dy}{dx}\right|_{(x,y)=(2,2)}$ if

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

Answer : _____

Round 1 2 3 4 5

#15 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#15 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#15 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#15 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#16 Calculus – Hustle
MAΘ 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
MAΘ 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
MAΘ National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#16 Calculus – Hustle
MAΘ 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

#17 Calculus – Hustle
MAΘ 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
MAΘ 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
MAΘ 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
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#18 Calculus – Hustle
MAΘ National Convention 2015

Find the radius of convergence of the series $\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} \cdot 3^n}$.

Answer : _____

Round 1 2 3 4 5

#18 Calculus – Hustle
MAΘ National Convention 2015

Find the radius of convergence of the series $\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} \cdot 3^n}$.

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#18 Calculus – Hustle
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Round 1 2 3 4 5

#18 Calculus – Hustle
MAΘ National Convention 2015

Find the radius of convergence of the series $\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} \cdot 3^n}$.

Answer : _____

Round 1 2 3 4 5

#19 Calculus – Hustle
MAΘ National Convention 2015

If $f(x) = 2x^3 + Ax^2 + Bx + C$, where A, B, and C has critical numbers of $x = -1$ and $x = \frac{1}{2}$, find $\frac{B}{A}$.

Answer : _____

Round 1 2 3 4 5

#19 Calculus – Hustle
MAΘ National Convention 2015

If $f(x) = 2x^3 + Ax^2 + Bx + C$, where A, B, and C has critical numbers of $x = -1$ and $x = \frac{1}{2}$, find $\frac{B}{A}$.

Answer : _____

Round 1 2 3 4 5

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MAΘ National Convention 2015

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Answer : _____

Round 1 2 3 4 5

#19 Calculus – Hustle
MAΘ National Convention 2015

If $f(x) = 2x^3 + Ax^2 + Bx + C$, where A, B, and C has critical numbers of $x = -1$ and $x = \frac{1}{2}$, find $\frac{B}{A}$.

Answer : _____

Round 1 2 3 4 5

#20 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#20 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

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Round 1 2 3 4 5

#20 Calculus – Hustle
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#21 Calculus – Hustle
MAΘ 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
MAΘ 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
MAΘ 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
MAΘ 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

#22 Calculus – Hustle
MAΘ 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
MAΘ 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
MAΘ 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
MAΘ National Convention 2015

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

Answer : _____

Round 1 2 3 4 5

#23 Calculus – Hustle
MAΘ 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 : _____

Round 1 2 3 4 5

#23 Calculus – Hustle
MAΘ 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 : _____

Round 1 2 3 4 5

#23 Calculus – Hustle
MAΘ 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 : _____

Round 1 2 3 4 5

#23 Calculus – Hustle
MAΘ 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 : _____

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
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
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
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

#25 Calculus – Hustle
MAΘ National Convention 2015

Evaluate: $\int_1^\infty \frac{\ln x}{x^2} dx$

Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle
MAΘ National Convention 2015

Evaluate: $\int_1^\infty \frac{\ln x}{x^2} dx$

Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle
MAΘ National Convention 2015

Evaluate: $\int_1^\infty \frac{\ln x}{x^2} dx$

Answer : _____

Round 1 2 3 4 5

#25 Calculus – Hustle
MAΘ National Convention 2015

Evaluate: $\int_1^\infty \frac{\ln x}{x^2} dx$

Answer : _____

Round 1 2 3 4 5