



**Hustle  
Calculus  
Test #643**



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**#1 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{\sin 4x}{x} \right]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#1 Calculus - Hustle**  
**MAO National Convention 2018**

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Round 1 2 3 4 5

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**MAO National Convention 2018**

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Round 1 2 3 4 5

**#1 Calculus - Hustle**  
**MAO National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{\ln(1+x)}{x} \right]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{\ln(1+x)}{x} \right]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{\ln(1+x)}{x} \right]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{\ln(1+x)}{x} \right]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#3 Calculus - Hustle**  
**MAΘ National Convention 2018**

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Find  $\frac{dy}{dx}$  if  $y = \frac{xe^x - x^2}{x + e^x}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#3 Calculus - Hustle**  
**MAΘ National Convention 2018**

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Find  $\frac{dy}{dx}$  if  $y = \frac{xe^x - x^2}{x + e^x}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#3 Calculus - Hustle**  
**MAΘ National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#3 Calculus - Hustle**  
**MAΘ National Convention 2018**

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Find  $\frac{dy}{dx}$  if  $y = \frac{xe^x - x^2}{x + e^x}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MAO National Convention 2018**

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Find  $\frac{dy}{dx}$  if  $y = \ln \tan x$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MAO National Convention 2018**

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Find  $\frac{dy}{dx}$  if  $y = \ln \tan x$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MAO National Convention 2018**

---

Find  $\frac{dy}{dx}$  if  $y = \ln \tan x$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MAO National Convention 2018**

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Find  $\frac{dy}{dx}$  if  $y = \ln \tan x$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#5 Calculus - Hustle**  
**MAO National Convention 2018**

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At what point(s) of the ellipse  $16x^2 + 9y^2 = 400$  does the ordinate decrease at the same rate as the abscissa increases?

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#5 Calculus - Hustle**  
**MAO National Convention 2018**

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**#5 Calculus - Hustle**  
**MAO National Convention 2018**

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**#5 Calculus - Hustle**  
**MAO National Convention 2018**

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**#6 Calculus - Hustle**  
**MAO National Convention 2018**

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The distance  $d$  that an image is from a certain lens in terms of  $c$ , the distance the object is from the lens, is given by  $d = \frac{10c}{c-10}$ . If the object distance is increasing at the rate of 0.2 cm/sec, how fast is the image distance changing when  $c = 15$  cm?

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#6 Calculus - Hustle**  
**MAO National Convention 2018**

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**MAO National Convention 2018**

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**MAO National Convention 2018**

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Round 1 2 3 4 5

**#7 Calculus - Hustle**  
**MAO National Convention 2018**

---

Find the equation of a normal line to the curve  $y = x \ln x$  that is parallel to the straight line  $2x - 2y + 3 = 0$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#7 Calculus - Hustle**  
**MAO National Convention 2018**

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**MAO National Convention 2018**

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Round 1 2 3 4 5



**#8 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{dx}{\sqrt[3]{(b+ax)^2}}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#8 Calculus - Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\int \frac{dx}{\sqrt[3]{(b+ax)^2}}$ .

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**MAO National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#9 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{1+2x^2}{x^2(1+x^2)} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#9 Calculus - Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\int \frac{1+2x^2}{x^2(1+x^2)} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#9 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{1+2x^2}{x^2(1+x^2)} dx$ .

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Round 1 2 3 4 5

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**MAO National Convention 2018**

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Evaluate  $\int \frac{1+2x^2}{x^2(1+x^2)} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#10 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{5x^2 + 2x - 3}{x + 2} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#10 Calculus – Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\int \frac{5x^2 + 2x - 3}{x + 2} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#10 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{5x^2 + 2x - 3}{x + 2} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#10 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{5x^2 + 2x - 3}{x + 2} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#11 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\frac{d}{dx} \int_5^{x^2} \sqrt{t^2 + 3t + 1} dt$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#11 Calculus – Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\frac{d}{dx} \int_5^{x^2} \sqrt{t^2 + 3t + 1} dt$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#11 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\frac{d}{dx} \int_5^{x^2} \sqrt{t^2 + 3t + 1} dt$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#11 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\frac{d}{dx} \int_5^{x^2} \sqrt{t^2 + 3t + 1} dt$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#12 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Evaluate  $\int e^x \cos x dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#12 Calculus – Hustle**  
**MAΘ National Convention 2018**

---

Evaluate  $\int e^x \cos x dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

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**MAΘ National Convention 2018**

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Evaluate  $\int e^x \cos x dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#12 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Evaluate  $\int e^x \cos x dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#13 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{2x-34}{3x^2-11x-4} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#13 Calculus - Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\int \frac{2x-34}{3x^2-11x-4} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#13 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{2x-34}{3x^2-11x-4} dx$ .

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Round 1 2 3 4 5

**#13 Calculus - Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int \frac{2x-34}{3x^2-11x-4} dx$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int_{-a}^a \frac{dx}{\sqrt{a^2 - x^2}}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Calculus – Hustle**  
**MAO National Convention 2018**

---

Evaluate  $\int_{-a}^a \frac{dx}{\sqrt{a^2 - x^2}}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int_{-a}^a \frac{dx}{\sqrt{a^2 - x^2}}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#14 Calculus – Hustle**  
**MAO National Convention 2018**

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Evaluate  $\int_{-a}^a \frac{dx}{\sqrt{a^2 - x^2}}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#15 Calculus – Hustle**  
**MAO National Convention 2018**

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Let  $g(x)$  be the inverse of  $f(x)$ . The selected values of  $f(x)$  and  $f'(x)$  are given in the table below. Find the value of  $g'(5)$ .

$x$	0	2	5
$f(x)$	8	5	3
$f'(x)$	7	1	4

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#15 Calculus – Hustle**  
**MAO National Convention 2018**

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**MAO National Convention 2018**

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**MAO National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5



**#16 Calculus – Hustle**  
**MAO National Convention 2018**

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Find any real values of  $x$  for which the derivative of  $y = \frac{x^2}{\sqrt{x^2+1}}$  is zero.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#16 Calculus – Hustle**  
**MAO National Convention 2018**

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Find any real values of  $x$  for which the derivative of  $y = \frac{x^2}{\sqrt{x^2+1}}$  is zero.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#16 Calculus – Hustle**  
**MAO National Convention 2018**

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Find any real values of  $x$  for which the derivative of  $y = \frac{x^2}{\sqrt{x^2+1}}$  is zero.

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Round 1 2 3 4 5

**#16 Calculus – Hustle**  
**MAO National Convention 2018**

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Find any real values of  $x$  for which the derivative of  $y = \frac{x^2}{\sqrt{x^2+1}}$  is zero.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#17 Calculus - Hustle**  
**MAO National Convention 2018**

---

Find the  $y$ -intercept of the line normal to the curve  $y = 3x - x^3$  at  $(3, -18)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#17 Calculus - Hustle**  
**MAO National Convention 2018**

---

Find the  $y$ -intercept of the line normal to the curve  $y = 3x - x^3$  at  $(3, -18)$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#17 Calculus - Hustle**  
**MAO National Convention 2018**

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**#17 Calculus - Hustle**  
**MAO National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#18 Calculus – Hustle**  
**MAO National Convention 2018**

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The illuminance  $I$ , which is positive, at a point is inversely proportional to the square of the distance  $x$  from the source. Find  $\lim_{x \rightarrow 0} I$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#18 Calculus – Hustle**  
**MAO National Convention 2018**

---

The illuminance  $I$ , which is positive, at a point is inversely proportional to the square of the distance  $x$  from the source. Find  $\lim_{x \rightarrow 0} I$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#18 Calculus – Hustle**  
**MAO National Convention 2018**

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Round 1 2 3 4 5

**#18 Calculus – Hustle**  
**MAO National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#19 Calculus – Hustle**  
**MAO National Convention 2018**

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The strength of a rectangular beam is proportional to the product of its width and the square of its depth. Find the dimensions, in inches, of the strongest beam that can be cut from a circular log 16 inches in diameter.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#19 Calculus – Hustle**  
**MAO National Convention 2018**

---

The strength of a rectangular beam is proportional to the product of its width and the square of its depth. Find the dimensions, in inches, of the strongest beam that can be cut from a circular log 16 inches in diameter.

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#19 Calculus – Hustle**  
**MAO National Convention 2018**

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**MAO National Convention 2018**

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Round 1 2 3 4 5

**#20 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Let  $f(x) = x - x^2$  and  $g(x) = ax$ . Determine  $a$  so that the region above the graph of  $g$  and below the graph of  $f$  has area  $\frac{9}{2}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#20 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Let  $f(x) = x - x^2$  and  $g(x) = ax$ . Determine  $a$  so that the region above the graph of  $g$  and below the graph of  $f$  has area  $\frac{9}{2}$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

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**MAΘ National Convention 2018**

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Round 1 2 3 4 5

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**MAΘ National Convention 2018**

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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#21 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Determine the derivative  $f'(x)$  of  
 $f(x) = \sin[\sin(\sin x)]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#21 Calculus – Hustle**  
**MAΘ National Convention 2018**

---

Determine the derivative  $f'(x)$  of  
 $f(x) = \sin[\sin(\sin x)]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#21 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Determine the derivative  $f'(x)$  of  
 $f(x) = \sin[\sin(\sin x)]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#21 Calculus – Hustle**  
**MAΘ National Convention 2018**

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Determine the derivative  $f'(x)$  of  
 $f(x) = \sin[\sin(\sin x)]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Calculus – Hustle**  
**MAO National Convention 2018**

---

Determine the derivative  $f'(x)$  of

$$f(x) = \frac{\sin^2 x}{\sin x^2}.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Calculus – Hustle**  
**MAO National Convention 2018**

---

Determine the derivative  $f'(x)$  of

$$f(x) = \frac{\sin^2 x}{\sin x^2}.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Calculus – Hustle**  
**MAO National Convention 2018**

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Round 1 2 3 4 5

**#22 Calculus – Hustle**  
**MAO National Convention 2018**

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Determine the derivative  $f'(x)$  of

$$f(x) = \frac{\sin^2 x}{\sin x^2}.$$

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MAΘ National Convention 2018**

---

Find the average value of  $f(x) = 2x^2 + 3x + 3$  in the interval  $[1,4]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MAΘ National Convention 2018**

---

Find the average value of  $f(x) = 2x^2 + 3x + 3$  in the interval  $[1,4]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MAΘ National Convention 2018**

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Find the average value of  $f(x) = 2x^2 + 3x + 3$  in the interval  $[1,4]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MAΘ National Convention 2018**

---

Find the average value of  $f(x) = 2x^2 + 3x + 3$  in the interval  $[1,4]$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5



**#24 Calculus – Hustle**  
**MAO National Convention 2018**

---

Find the volume of the solid generated by revolving about the x-axis the area bounded by the parabolas  $y^2 = 8x$  and  $8y = x^2$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#24 Calculus – Hustle**  
**MAO National Convention 2018**

---

Find the volume of the solid generated by revolving about the x-axis the area bounded by the parabolas  $y^2 = 8x$  and  $8y = x^2$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#24 Calculus – Hustle**  
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Find the volume of the solid generated by revolving about the x-axis the area bounded by the parabolas  $y^2 = 8x$  and  $8y = x^2$ .

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Round 1 2 3 4 5

**#24 Calculus – Hustle**  
**MAO National Convention 2018**

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Find the volume of the solid generated by revolving about the x-axis the area bounded by the parabolas  $y^2 = 8x$  and  $8y = x^2$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#25 Calculus - Hustle**  
**MAO National Convention 2018**

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Solve for y if  $\frac{dy}{dx} = \frac{5x+2}{7y}$ ,  $y > 0$ , and  
 $y = 1$  when  $x = 2$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#25 Calculus - Hustle**  
**MAO National Convention 2018**

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 $y = 1$  when  $x = 2$ .

Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#25 Calculus - Hustle**  
**MAO National Convention 2018**

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