# #1 Calculus - Hustle MA⊕ National Convention 2022

Let  $f(x) = \sum_{i=0}^{10} x^i$ . Compute f'(1).

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Answer	•	

Round 1 2 3 4 5

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

Round 1 2 3 4 5

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

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

Round 1 2 3 4 5

#### #2 Calculus – Hustle MA⊕ National Convention 2022

Compute

$$\lim_{n\to\infty}\frac{1}{n\cdot\ln(1+\frac{1}{n})}$$

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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$$\lim_{n\to\infty}\frac{1}{n\cdot\ln(1+\frac{1}{n})}$$

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

Round 1 2 3 4 5

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

#3 Calculus - Hustle	
MA® National Convention 2	022

Let  $f(x) = x^{x \ln x}$ . Compute f'(e).

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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

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

# #4 Calculus - Hustle MA⊖ National Convention 2022

Compute

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Round 1 2 3 4 5

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

Round 1 2 3 4 5

#4 Calculus - Hustle MA⊖ National Convention 2022

Compute

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

Round 1 2 3 4 5

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#5 Calculus - Hustle	
<b>MA® National Convention</b>	2022

Compute

$$\lim_{n \to \frac{\pi}{2}} (\cos n)^{(\tan n)}$$

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

Round 1 2 3 4 5

#5 Calculus - Hustle MA⊕ National Convention 2022

Compute

$$\lim_{n \to \frac{\pi}{2}} (\cos n)^{(\tan n)}$$

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

Round 1 2 3 4 5

#5 Calculus - Hustle MA⊖ National Convention 2022

Compute

 $\lim_{n \to \frac{\pi}{2}} (\cos n)^{(\tan n)}$ 

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

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

Round 1 2 3 4 5

# #6 Calculus - Hustle MA⊖ National Convention 2022

# Let $f(x) = \sum_{i=0}^{5} x^{i}$ . Find the value of $\int_{0}^{1} f(x) dx$

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

Round 1 2 3 4 5

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

#### #7 Calculus – Hustle MA⊕ National Convention 2022

Find the value of

$$\int_{-1}^{1} \sqrt{4-x^2} \, dx$$

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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

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

#### #8 Calculus – Hustle MA⊕ National Convention 2022

Estimate the area under  $f(x) = x^3$  on the interval [0, 5] using the right-hand approximation for 5 equal subintervals.

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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

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Round 1 2 3 4 5

# #9 Calculus – Hustle MA⊕ National Convention 2022

Evaluate

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{\sin x \cos x} dx$$

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Round 1 2 3 4 5

#9 Calculus - Hustle MA⊚ National Convention 2022

Evaluate

$$\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{1}{\sin x \cos x} dx$$

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

Round 1 2 3 4 5

#9 Calculus – Hustle MA⊕ National Convention 2022

Evaluate

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{\sin x \cos x} dx$$

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

Round 1 2 3 4 5

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

#### #10 Calculus - Hustle MA⊕ National Convention 2022

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Round 1 2 3 4 5

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Round 1 2 3 4 5

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

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Round 1 2 3 4 5

#### #11 Calculus - Hustle MA⊚ National Convention 2022

Andy has a farm. He also has 1000 ft of wood that he can use to make a fence. Since he has a barn longer than 1000 ft long, he can use it as one of the sides for his rectangular field. What's the maximum area he can enclose in his field?

#11 Calculus - Hustle	
MA@ National Convention	2022

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	answei	:	

Round 1 2 3 4 5

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Round 1 2 3 4 5

#### #12 Calculus – Hustle MA⊕ National Convention 2022

Buffy is pouring some water into his cubical cup at a rate of  $5 \frac{ml}{sec}$ . His cube has side lengths of 5 cm. When the height of the water in his cup is 2 cm, how fast is the water level rising (in  $\frac{cm}{sec}$ )?

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Round 1 2 3 4 5

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#### #13 Calculus – Hustle MA® National Convention 2022

Deez is good at waiting. He takes out a cake that is initially at  $200^{\circ} F$  from an oven, and places it in a  $80^{\circ} F$  room. After 10 minutes, the cake has cooled down to  $140^{\circ} F$ . How many minues must Deez wait from when he took the cake out until the cake reaches a warm  $95^{\circ} F$ ? Assume that Newton's law of cooling applies to this cake.

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Round 1 2 3 4 5

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#### #14 Calculus - Hustle MA⊕ National Convention 2022

Jeffrey is a god at integrals. However, for some reason, he can't figure out how Riemann sums and integrals are related. Help him find the value of the following sum:

$$\lim_{n\to\infty}\sum_{i=1}^n\frac{1}{n}\left(e^{\frac{i}{n}}\cdot\frac{i}{n}\right)$$

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

Round 1 2 3 4 5

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Round 1 2 3 4 5

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#### #15 Calculus - Hustle MA⊕ National Convention 2022

Konwoo likes to draw spirals. Help him find the arc length of the spiral  $r = e^{2\theta}$  formed from the **pole** to the point  $(e^4, 2)$ .

#### #15 Calculus - Hustle MA⊕ National Convention 2022

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Answer	•	
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Round 1 2 3 4 5

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Round 1 2 3 4 5

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#### #16 Calculus – Hustle MA® National Convention 2022

What is the volume of the solid formed when the region bounded by  $y = \frac{1}{x}$ , x = 1 and the *x*-axis is revolved about the *x*-axis?

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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

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

#### #17 Calculus – Hustle MA® National Convention 2022

What is the surface area of the solid formed when the region bounded by  $y = \frac{1}{x}$ , x = 1 and the *x*-axis is revolved about the *x*-axis?

#17 Calculus - Hustle	
MA@ National Convention	2022

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<b>Answer:</b>	
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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

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

#### #18 Calculus – Hustle MA⊚ National Convention 2022

Find the value of

$$\int_0^1 e^{e^x} dx + \int_e^{e^e} \ln\left(\ln(x)\right) dx$$

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

Round 1 2 3 4 5

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

#### #19 Calculus – Hustle MA⊕ National Convention 2022

Consider the region R bounded by the lines y = -2x, y = 0 and x = 3. Find the volume of the solid formed by revolving R around the line 3x + 4y = 12.

#19 Calculus - Hustle	
MA@ National Convention	2022

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Answer	:	
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Round 1 2 3 4 5

#### #19 Calculus - Hustle MA⊚ National Convention 2022

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

Round 1 2 3 4 5

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

Round 1 2 3 4 5

Answer:\_\_\_\_

#### #20 Calculus - Hustle MA⊕ National Convention 2022

Determine the area of the region that falls in either  $r = 1 + \cos \theta$  or  $r = 1 + \sin \theta$ .

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Round 1 2 3 4 5

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

Round 1 2 3 4 5

#### #20 Calculus - Hustle MA® National Convention 2022

Determine the area of the region that falls in either  $r = 1 + \cos \theta$  or  $r = 1 + \sin \theta$ .

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

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

Round 1 2 3 4 5

# #21 Calculus - Hustle MA⊕ National Convention 2022

Find the value of

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

Round 1 2 3 4 5

#21 Calculus - Hustle MA⊕ National Convention 2022

Find the value of

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

Round 1 2 3 4 5

#21 Calculus - Hustle MA® National Convention 2022

Find the value of

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

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

Round 1 2 3 4 5

#### #22 Calculus – Hustle MA⊚ National Convention 2022

(T/F): Let us have two sequences of positive terms  $a_n$  and  $b_n$ . If we have that  $\sum a_n$  and  $\sum b_n$  both converge, then is it necessarily true that  $\sum a_n b_n$  converges?

#### #22 Calculus – Hustle MA⊕ National Convention 2022

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Answer :			
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	AllSWei	-	

Round 1 2 3 4 5

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Round 1 2 3 4 5

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

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

Round 1 2 3 4 5

# #23 Calculus – Hustle MA⊕ National Convention 2022

Compute

$$\lim_{x \to 0} \frac{3\tan^{-1} x^2 - 3x^2 + x^6}{x^{10}}$$

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Round 1 2 3 4 5

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Compute

$$\lim_{x \to 0} \frac{3\tan^{-1} x^2 - 3x^2 + x^6}{x^{10}}$$

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

Round 1 2 3 4 5

#23 Calculus - Hustle MA⊕ National Convention 2022

Compute

$$\lim_{x \to 0} \frac{3\tan^{-1} x^2 - 3x^2 + x^6}{x^{10}}$$

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

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

Round 1 2 3 4 5

# #24 Calculus - Hustle MA⊕ National Convention 2022

Compute

$$\sum_{i=0}^{5} {15 \choose 3i}$$

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Compute

$$\sum_{i=0}^{5} {15 \choose 3i}$$

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

Round 1 2 3 4 5

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Compute

$$\sum_{i=0}^{5} {15 \choose 3i}$$

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

Round 1 2 3 4 5

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Compute

$$\sum_{i=0}^{5} {15 \choose 3i}$$

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

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

#### #25 Calculus – Hustle MA⊚ National Convention 2022

Last question (unless you skipped several of the previous ones)! Let f(x) = 1. Compute

$$f'(0) + \int\limits_0^1 f(x) dx$$

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

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Round 1 2 3 4 5