

**#1 Calculus - Hustle**  
**MA@ National Convention 2022**

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

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

Round 1 2 3 4 5

**#1 Calculus - Hustle**  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

$$\lim_{n \rightarrow \infty} \frac{1}{n \cdot \ln\left(1 + \frac{1}{n}\right)}$$

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

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Compute

$$\lim_{n \rightarrow \infty} \frac{1}{n \cdot \ln\left(1 + \frac{1}{n}\right)}$$

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

Round 1 2 3 4 5

**#2 Calculus - Hustle**  
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Round 1 2 3 4 5

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

Round 1 2 3 4 5

**#3 Calculus - Hustle**  
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Let  $f(x) = x^{x \ln x}$ . Compute  $f'(e)$ .

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

Round 1 2 3 4 5

**#3 Calculus - Hustle**  
**MA@ National Convention 2022**

---

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

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

Round 1 2 3 4 5

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Round 1 2 3 4 5

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

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

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Compute

$$\lim_{n \rightarrow \infty} \left( e^n - e^{\frac{n}{2}} \right)^{\frac{1}{n}}$$

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

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Compute

$$\lim_{n \rightarrow \infty} \left( e^n - e^{\frac{n}{2}} \right)^{\frac{1}{n}}$$

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

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
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$$\lim_{n \rightarrow \infty} \left( e^n - e^{\frac{n}{2}} \right)^{\frac{1}{n}}$$

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

Round 1 2 3 4 5

**#4 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

$$\lim_{n \rightarrow \infty} \left( e^n - e^{\frac{n}{2}} \right)^{\frac{1}{n}}$$

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

Round 1 2 3 4 5

**#5 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#5 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Compute

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

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

Round 1 2 3 4 5

**#5 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

Round 1 2 3 4 5

**#5 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#6 Calculus - Hustle**  
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---

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

$$\int_0^1 f(x) dx$$

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

Round 1 2 3 4 5

**#6 Calculus - Hustle**  
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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

**#7 Calculus - Hustle**  
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Find the value of

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

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

Round 1 2 3 4 5

**#7 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

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

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

Round 1 2 3 4 5

**#7 Calculus - Hustle**  
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Round 1 2 3 4 5

**#7 Calculus - Hustle**  
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Find the value of

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

Round 1 2 3 4 5

**#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.

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

Round 1 2 3 4 5

**#8 Calculus - Hustle**  
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Round 1 2 3 4 5

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Round 1 2 3 4 5



**#9 Calculus - Hustle**  
**MA@ National Convention 2022**

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Evaluate

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

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

Round 1 2 3 4 5

**#9 Calculus - Hustle**  
**MA@ National Convention 2022**

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Evaluate

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

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

Round 1 2 3 4 5

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

Round 1 2 3 4 5

**#10 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Evaluate

$$\int \frac{1}{x\sqrt{x} + \sqrt{x}} dx$$

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

Round 1 2 3 4 5

**#10 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Evaluate

$$\int \frac{1}{x\sqrt{x} + \sqrt{x}} dx$$

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

Round 1 2 3 4 5

**#10 Calculus - Hustle**  
**MA@ National Convention 2022**

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Evaluate

$$\int \frac{1}{x\sqrt{x} + \sqrt{x}} dx$$

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

Round 1 2 3 4 5

**#10 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Evaluate

$$\int \frac{1}{x\sqrt{x} + \sqrt{x}} dx$$

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

Round 1 2 3 4 5

**#11 Calculus - Hustle**  
**MA<sup>©</sup> 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?

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

Round 1 2 3 4 5

**#11 Calculus - Hustle**  
**MA<sup>©</sup> National Convention 2022**

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

Round 1 2 3 4 5

**#12 Calculus - Hustle**  
**MA<sup>+</sup> 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  $5 \text{ cm}$ . When the height of the water in his cup is  $2 \text{ cm}$ , how fast is the water level rising (in  $\frac{cm}{sec}$ )?

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

Round 1 2 3 4 5

**#12 Calculus - Hustle**  
**MA<sup>+</sup> National Convention 2022**

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Round 1 2 3 4 5

**#13 Calculus – Hustle**  
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---

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 minutes 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.

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

Round 1 2 3 4 5

**#13 Calculus – Hustle**  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#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:

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

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

Round 1 2 3 4 5

**#14 Calculus - Hustle**  
**MA@ National Convention 2022**

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**#14 Calculus - Hustle**  
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Round 1 2 3 4 5

**#14 Calculus - Hustle**  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#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  $(e^4, 2)$ .

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

Round 1 2 3 4 5

**#15 Calculus - Hustle**  
**MA@ National Convention 2022**

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**#15 Calculus - Hustle**  
**MA@ National Convention 2022**

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**#15 Calculus - Hustle**  
**MA@ National Convention 2022**

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

Round 1 2 3 4 5

**#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?

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

Round 1 2 3 4 5

**#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

**#16 Calculus - Hustle**  
**MA@ National Convention 2022**

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Round 1 2 3 4 5

**#16 Calculus - Hustle**  
**MA@ National Convention 2022**

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

Round 1 2 3 4 5



**#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?

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

Round 1 2 3 4 5

**#17 Calculus - Hustle**  
**MA@ National Convention 2022**

---

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

Round 1 2 3 4 5

**#17 Calculus - Hustle**  
**MA@ National Convention 2022**

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

Round 1 2 3 4 5

**#17 Calculus - Hustle**  
**MA@ National Convention 2022**

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

Round 1 2 3 4 5

**#18 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

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

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

Round 1 2 3 4 5

**#18 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

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

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

Round 1 2 3 4 5

**#18 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

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

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

Round 1 2 3 4 5

**#18 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

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

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

Round 1 2 3 4 5

**#19 Calculus - Hustle**  
**MA $\odot$  National Convention 2022**

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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  $3x + 4y = 12$ .

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

Round 1 2 3 4 5

**#19 Calculus - Hustle**  
**MA $\odot$  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  $3x + 4y = 12$ .

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

Round 1 2 3 4 5

**#19 Calculus - Hustle**  
**MA $\odot$  National Convention 2022**

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

Round 1 2 3 4 5

**#19 Calculus - Hustle**  
**MA $\odot$  National Convention 2022**

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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 : \_\_\_\_\_

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 : \_\_\_\_\_

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 : \_\_\_\_\_

Round 1 2 3 4 5

**#20 Calculus - Hustle**  
**MA@ National Convention 2022**

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

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

Round 1 2 3 4 5

**#21 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

$$\sum_{i=1}^{\infty} \frac{1}{i^2}$$

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

Round 1 2 3 4 5

**#21 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

$$\sum_{i=1}^{\infty} \frac{1}{i^2}$$

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

Round 1 2 3 4 5

**#21 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

$$\sum_{i=1}^{\infty} \frac{1}{i^2}$$

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

Round 1 2 3 4 5

**#21 Calculus - Hustle**  
**MA@ National Convention 2022**

---

Find the value of

$$\sum_{i=1}^{\infty} \frac{1}{i^2}$$

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?

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

Round 1 2 3 4 5

**#22 Calculus – Hustle**  
**MA@ National Convention 2022**

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Round 1 2 3 4 5

**#22 Calculus – Hustle**  
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Answer : \_\_\_\_\_

Round 1 2 3 4 5

**#22 Calculus – Hustle**  
**MA@ National Convention 2022**

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(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?

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

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#23 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#24 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#24 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#24 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5

**#24 Calculus - Hustle**  
**MA@ National Convention 2022**

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Compute

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

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

Round 1 2 3 4 5



**#25 Calculus - Hustle**  
**MA@ National Convention 2022**

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

$$f'(0) + \int_0^1 f(x) dx$$

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

Round 1 2 3 4 5

**#25 Calculus - Hustle**  
**MA@ National Convention 2022**

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

$$f'(0) + \int_0^1 f(x) dx$$

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

Round 1 2 3 4 5

**#25 Calculus - Hustle**  
**MA@ National Convention 2022**

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

$$f'(0) + \int_0^1 f(x) dx$$

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

Round 1 2 3 4 5

**#25 Calculus - Hustle**  
**MA@ National Convention 2022**

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

$$f'(0) + \int_0^1 f(x) dx$$

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

Round 1 2 3 4 5