

Rules!

- Format:
 - The paper consists of 8 questions divided into 4 sheets (2 questions per sheet).
 - Sheets are labeled x_1, x_2, x_3, x_4 , with x_i harder than x_j if $i > j$.
 - You may start with any sheet but must submit it to receive the next one.
 - Once submitted, answers are locked and cannot be changed.
 - You may leave once all 4 sheets are submitted.
- Scoring:
 - x_1 : 4 marks per question
 - x_2 : 5 marks per question
 - x_3 : 7 marks per question
 - x_4 : 9 marks per question
- Advancement:
 - The top 8 participants (plus at most 2 ties for the last place) advance to the tournament stage.
 - If further ties occur, tie-breaker integrals will decide the final slots.

Paper Round: S1

Name:

CMI Integration Bee 2025

1.

$$\int \frac{x^2 - 2}{(x^4 + 5x^2 + 4) \arctan\left(\frac{x^2+2}{x}\right)} dx$$

2.

$$\left[\sup_{a \in [0,2]} \int_0^2 \frac{\lfloor x+a \rfloor!}{(\lfloor a \rfloor!)^2} dx - \inf_{b \in [0,2]} \int_0^2 \frac{\lfloor x+b \rfloor!}{(\lfloor b \rfloor!)^2} dx \right]$$

Paper Round: S2

Name:

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3.

$$\int_0^5 \left(\frac{1}{\sqrt{5x}} \left(\frac{1+\sqrt{5}}{2} \right)^{\lceil x \rceil} - \frac{1}{\sqrt{5x}} \left(\frac{1-\sqrt{5}}{2} \right)^{\lceil x \rceil} \right) dx$$

4.

$$\int_1^\infty \frac{1}{\left[\sum_{n=1}^{\lfloor x \rfloor} \frac{\lfloor x \rfloor (-1)^{\lfloor x+1 \rfloor}}{n^{\lfloor x \rfloor}} \right]} dx$$

Paper Round: S3

Name:

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5. Let $a \in \mathbb{R} \setminus \{0\}$.

$$\int x^2 \cos(a \ln x) dx$$

6.

$$\int \frac{1+2x^3}{1+x^2-2x^3+x^6} dx$$

Paper Round: S4

Name:

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7.

$$\int_0^{\infty} \frac{e^{-x} \cos(x) - e^{-x^2}}{\sqrt{x}} dx$$

8.

$$\lim_{n \rightarrow \infty} n \cdot 2^n \int_1^n \frac{dx}{(1+x^2)^n}$$
