Integration Bee Answer Key

HMMT February 2024

Qualifiers

1 $\frac{1}{3}$

2 $\frac{121}{24}$

3 $\frac{1}{2}$

4 $\frac{x^{1+\ln(2)}}{1+\ln 2}$

5 e^{e^x+x}

6 $2024\sqrt{2024}$

7 π

8 $-x\cot(x)+\ln(\sin(x))-\frac{1}{2}x^2$

9 $-3x^{-1/3}+3\ln(1+x^{-1/3})$

10 $\sqrt{3}+\frac{\pi}{3}$

11 $\frac{61}{192}$

12 $\sin(2)+\cos(2)-1$

13 $\frac{\pi}{4}$

14 $\ln(\tan(x)+\sec^2(x))$

15 $\frac{4\pi}{3\sqrt{3}}$

16 $\frac{\pi}{\sqrt{2}}$

17 $\ln 2-2$

18 $\sqrt{6}-\frac{\sqrt{2}}{3}-\frac{4}{3}$

19 0

20 15951.2

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Finals

Sample

[1] 1012

[2] $\dfrac{1}{2025}$

Semifinal 1

[1] $\dfrac{1}{2}(\sin 1 - \cos 1)$

[2] $-\dfrac{1}{2}$

[3] $\dfrac{\pi^{3/2}}{6}$

Semifinal 2

[1] $2\sqrt{\sec x}$

[2] $-\pi \ln(2)$

[3] $\dfrac{\pi}{4}$

Third Place

[1] $\ln 4 - 2$

[2] $\dfrac{1}{8}\sin(2x) - \dfrac{x}{4}\cos(2x)$

[3] $\dfrac{1}{6}$

Final

[1] $4\arctan(\sqrt{x}) - \dfrac{2\ln(1+x)}{\sqrt{x}}$

[2] 2

[3] $\dfrac{\pi}{8}$

[4] $1 - e^{-e}(e+1)$

[5] $\dfrac{x^2}{2} + \dfrac{x}{2}$

Sudden Death

[1] $\dfrac{4}{\ln 2} - 1$

[2] 12

[3] $\dfrac{5\pi}{16}$

[4] $-\dfrac{\ln x}{x+1} + \ln x - \ln(x+1)$

[5] $x^2 \tan\left(\dfrac{x}{2}\right)$

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