November 2019 HMMT
Integration Bee Semifinals

November 8, 2019

1.
$$\int \frac{2x^3 - 1}{x^4 + x}\, dx$$

2.
$$\int_2^3 \lfloor x^2 \rfloor\, dx$$

3.
$$\int_0^{2\pi} \min(\sin x, 0)\, dx$$

4.
$$\int \sqrt[3]{x \sqrt[3]{x \sqrt[3]{x \sqrt[3]{\cdots}}}}\, dx$$

5.
$$\int \frac{1}{x^{2/3} + x^{4/3}}\, dx$$

6.
$$\int x \sin^2 x\, dx$$

7.
$$\int \frac{xe^x}{(1 + x)^2}\, dx$$

8.
$$\int_0^1 \frac{\log(1 - x)}{x}\, dx$$

9.
$$\int_{-\infty}^{\infty} \frac{1}{(1 + x^2)^2}\, dx$$

10.

$$\int \frac{\sin(x)}{2\sqrt{x}} + \sqrt{x}\cos x \, dx$$

11.

$$\int_0^1 (x(1-x))^2 \lfloor 2x \rfloor \, dx$$

12.

$$\int_0^{\pi/2} \frac{dx}{1 + (\tan x)^\pi}$$

13.

$$\int_0^{2\pi} \frac{dx}{2 + \cos x}$$

14.

$$\int_0^\infty x^5 e^{-x^2} \, dx$$

15.

$$\int_0^1 \sin^{-1}(x) + \cos^{-1}(x) \, dx$$

16.

$$\int \frac{1 - x\log x}{e^x} \, dx$$

17.

$$\int_3^7 \frac{\log(x+2)}{\log(x+2) + \log(12-x)} \, dx$$