CHMMC 2023 Integration Bee Qualification Test

Name: **Team:**

You will have 10 minutes to complete the following 14 integrals. Since all of the following integrals are definite, **please box your answer next to the corresponding integral** so the graders can clearly delineate your answers. You may use the back of this page for scratch work as well as additional pieces of paper. Do not use this side of the test for work. **Please do not complete this test unless you have the full intention of competing in the finals. No computers, calculators, or outside sources of collaboration.**

Problem 1. $\int_0^8 5 \cdot x^{\frac{2}{3}} \, dx$

Problem 2. $\int_0^{12} \frac{1}{(x-16)\ln 2} \, dx$

Problem 3. $\int_{-20}^{20} 20 - |x| \, dx$

Problem 4. $\int_1^\infty \frac{1}{\sqrt{x}(1+x)} \, dx$

Problem 5. $\int_{-1}^1 \frac{1}{\sqrt{4-x^2}} \, dx$

Problem 6. $\int_0^2 (x^2-1) \cdot (x^3-3x)^{\frac{4}{3}} \, dx$

Problem 7. $\int_1^2 \frac{2x^3-1}{x^4+x} \, dx$

Problem 8. $\int_0^{2024} x - \lfloor x \rfloor \, dx$

Problem 9. $\int_0^\pi \frac{e^{\cos(x)}}{e^{\cos(x)} + e^{-\cos(x)}} \, dx$

Problem 10. $\int_0^1 \binom{22}{20} x^2 (1-x)^{20} \, dx$

Problem 11. $\int_1^e x^{\ln(x)-1} \cdot \ln(x) \, dx$

Problem 12. $\int_0^{e^\pi} \sin(\ln(x)) \, dx$

Problem 13. $\int_1^e \frac{\ln(x)}{(\ln(x)+1)^2} \, dx$

Problem 14. $\int_0^1 \left\lfloor \sin\left(\frac{\pi}{x}\right) \right\rfloor \, dx$