UCSD Math Club Integration Bee Qualifying Exam

May 7, 2014

Name: _____ **Email:** _____

Phone: _____ **Major:** _____

Please write legibly. Write your answer to each problem in the space provided. Answers to indefinite integrals must be in terms of x; the constant of integration is optional. Answers to definite integrals must be simplified as much as possible. You do not need to show your work. Each problem is worth one point, and there is no partial credit. Complete as many problems as you can. You may not use any calculators, electronic devices, books, or notes. Good luck!

Note. The function log is the natural (base e) logarithm. The function arctan is the inverse of the function tan on the interval $(-\pi/2, \pi/2)$. For a real number x, $\lfloor x \rfloor$ (the *floor* of x) denotes the greatest integer less than or equal to x (e.g., $\lfloor 2.3 \rfloor = 2$).

1. $\displaystyle\int x^{2014}\,dx$ _____

2. $\displaystyle\int (2x+1)(3x-2)\,dx$ _____

3. $\displaystyle\int \frac{x^5 - x + 1}{x^2}\,dx$ _____

4. $\displaystyle\int_1^3 \left|x^2 - 4\right|\,dx$ _____

5. $\displaystyle\int \frac{\cos(\pi x)}{\sin^2(\pi x)}\,dx$ _____

6. $\displaystyle\int x^{-1/5}\log(x)\,dx$ _____

7. $\displaystyle\int x\cos(x)\sin(x)\,dx$ _____

8. $\displaystyle\int \log\left(\frac{1}{x}\right)\,dx$ _____

9. $\displaystyle\int_0^\infty \frac{\arctan(x)}{x^2+1}\,dx$ _____

10. $\displaystyle\int x\left(e^x + \cos(x) + \sin(x)\right)\,dx$ _____

11. $\displaystyle\int \frac{e^x}{e^{2x}+e^x}\,dx$ _____

12. $\displaystyle\int \frac{1}{\tan^2(x)}\,dx$ _____

13. $\displaystyle\int_0^1 \frac{x^2}{1+x^2}\,dx$ _____

14. $\displaystyle\int \frac{\sin^2(x)(1+\tan^2(x))}{\tan^2(x)}\,dx$ _____

15. $\displaystyle\int \left(2e^{x^2}x^2+e^{x^2}\right)\,dx$ _____

16. $\displaystyle\int_0^\infty \pi^{-\lfloor x\rfloor}\,dx$ _____

17. $\displaystyle\int_0^1 \sin(\arctan(x))\,dx$ _____

18. $\displaystyle\int e^x\tan(e^x)\,dx$ _____

19. $\displaystyle\int_0^\infty \frac{e^{-x}-e^{-\pi x}}{x}\,dx$ _____

20. $\displaystyle\int \frac{1}{x^{1/2}+x^{1/3}}\,dx$ _____

21. $\displaystyle\int \frac{\sqrt{1+\sqrt{x}}}{x}\,dx$ _____

22. $\displaystyle\int_{-\pi/4}^{\pi/4} \frac{\sin(x)+\sin(2x)}{\cos(x)+\cos(2x)}\,dx$ _____

23. $\displaystyle\int_0^\infty \frac{\log(x)}{1+x^2}\,dx$ _____

24. $\displaystyle\int \cos(\log(x))\,dx$ _____

25. $\displaystyle\int_0^\infty \frac{\sin(x)}{\sqrt{x}}\,dx$ _____