Name (first and last): _____

UNI: _____

INTEGRATION BEE

Qualifying Round

Duration: one hour

Columbia University

February 15, 2022

this qualifying test includes 29 integrals.

solve as many integrals as you can in one hour. write the final answer only. no calculator allowed.

1. $\int x^2\sqrt{1-x^6}\,dx$

2. $\int \frac{\sqrt{x+1}-\sqrt{x}}{\sqrt{x+1}+\sqrt{x}}\,dx$

3. $\int \ln(x^2+8x+17)\,dx$

4. $\int \frac{x^2}{1+x^6}\,dx$

5. $\int \sin(x)\sec^4(x)\,dx$

6. $\int \sin(\sqrt{x})\,dx$

7. $\int \sin^4(x)+\cos^4(x)\,dx$

8. $\int \frac{1}{1-\tan(x)}\,dx$

9. $\int \frac{1+\cos(x)}{1-\cos(x)}\,dx$

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

11. $\int \frac{1}{e^{2x}+1}\,dx$

12. $\int \ln^2(x)\,dx$

continued...

13. $\displaystyle\int \frac{1}{x - x^{2/3}}\, dx$

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

15. $\displaystyle\int \frac{1}{x^3\sqrt{x^2 + 1}}\, dx$

16. $\displaystyle\int \sin(6x)\cos(x)\, dx$

17. $\displaystyle\int \tan^2(x)\sec^4(x)\, dx$

18. $\displaystyle\int \frac{1 + x}{1 + x^2}\, dx$

19. $\displaystyle\int \frac{1}{(1 + \sqrt{x})^3}\, dx$

20. $\displaystyle\int \frac{1}{\sqrt{\tan(x)}}\, dx$

21. $\displaystyle\int \sin(\cos(\sin x))\sin(\sin x)\cos x dx$

22. $\displaystyle\int_0^1 \sqrt{1 - x^2} dx$

23. $\displaystyle\int \frac{\ln(5x)}{x\ln(x)} dx$

24. $\displaystyle\int \ln(x^2 + 4) dx$

25. $\displaystyle\int \frac{e^x}{\sin\sqrt{x} + \cos\sqrt{x}} dz$

26. $\displaystyle\int \cos\sqrt{x} dx$

27. $\displaystyle\int_0^{\pi} \frac{e^x + \cos x}{e^x + \sin x} dx$

28. $\displaystyle\int_{\pi/3}^{5\pi/6} \sqrt{\csc x - \sin x} dx$

29. $\displaystyle\int 2x \arctan x dx$