THE UK UNIVERSITY INTEGRATION BEE 2022/23

$$\int$$

OXFORD ROUND ONE

Friday, 20 January 2023

Sponsored by

Jane Street

1. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1+e^x} \mathrm{d}x$
2. $\int \sqrt{x\sqrt[3]{x\sqrt[4]{x\sqrt[5]{x\cdots}}}} \mathrm{d}x$
3. $\int_0^1 x^{\frac{1}{\ln x}} \mathrm{d}x$
4. $\int e^{x+e^x} \mathrm{d}x$
5. $\int_0^1 \ln\left(\frac{1+x}{1-x}\right) \mathrm{d}x$
6. $\int_0^\infty \frac{1}{1+e^{ax}} \mathrm{d}x$
7. $\int_0^\infty e^{-x}\sqrt{1-e^{-2x}} \mathrm{d}x$
8. $\int_0^{\frac{\pi}{2}} x \prod_{i=1}^{\infty} \cos\left(\frac{x}{2^i}\right) \mathrm{d}x$
9. $\int_0^{2\pi} \sin(\sin(x)-x) \mathrm{d}x$
10. $\int_0^{\frac{\pi}{2}} \frac{\mathrm{d}x}{\tan^{\sqrt{2}}(x)+1}$
11. $\int_0^1 \sqrt{\frac{1+x}{1-x}} \mathrm{d}x$
12. $\int_0^\infty \frac{\arctan x}{1+x} \frac{\mathrm{d}x}{\sqrt{x}}$
13. $\int_1^{\sqrt{3}} \frac{\arctan x + \operatorname{arccot} x}{x} \mathrm{d}x$
14. $\int \frac{\ln(2x)}{x \ln x} \mathrm{d}x$
15. $\int_0^\infty x^{2n} e^{-x^2} \mathrm{d}x$
16. $\int_0^1 (\sqrt{x}-x)^{\frac{3}{2}} \mathrm{d}x$
17. $\int_0^1 \sqrt{-\ln x} \mathrm{d}x$
18. $\int_0^{\frac{\pi}{2}} \frac{\tan^{-1}(b \sin x)}{\sin x} \mathrm{d}x$
19. $\int_0^1 \frac{\ln(1+x)}{x} \mathrm{d}x$
20. $\int_0^\infty \frac{x^2}{e^x-1} \mathrm{d}x$

21. $\int_0^\infty \frac{\ln(x^2+1)}{x^2+1}\mathrm{d}x$
22. $\int \frac{x^2+1}{x^4+1}\mathrm{d}x$
23. $\int_0^\infty e^{-x}\frac{\sin ax}{x}\mathrm{d}x$
24. $\int_0^1 \ln(x)\sin(\ln(x))\mathrm{d}x$
25. $\int_0^{\frac{\pi}{2}} (\ln(\tan\theta))^2\mathrm{d}\theta$
26. $\int_{-\infty}^\infty \frac{\cos x}{\cosh x}\mathrm{d}x$
27. $\int_0^{\frac{\pi}{2}} \frac{\cos x}{2-\sin(2x)}\mathrm{d}x$
28. $\int_0^1 \frac{x-1}{(x+1)\ln x}\mathrm{d}x$
29. $\int_0^\pi \sec x \ln\left(1+\frac{\cos x}{3}\right)\mathrm{d}x$
30. $\int_0^1 \frac{\sin(\log x)-\log x}{\log^2 x}\mathrm{d}x$