THE UK UNIVERSITY INTEGRATION BEE 2024/25

$$\int$$

ROUND ONE MARK SCHEME

1. $\dfrac{e^{i}-e^{-i}}{2i}=\sin(1)$
2. $xe^{x^{2024}}+C$
3. $\tan^{-1}(x^{x})+C$
4. $\dfrac{\mathrm{s}^2\mathrm{in}^2}{2}+\dfrac{\cos^3}{3}+C$
5. $\pi\ln(2)$
6. $\dfrac{\sqrt{\pi}}{2}$
7. $\dfrac{\pi^4}{120}=\dfrac{3}{4}\zeta(4)$
8. $\dfrac{\pi}{2}$
9. 4
10. $\dfrac{\sqrt{\pi}}{2}e^{-x^2}$
11. $\dfrac{\pi^2}{8}$
12. $\dfrac{1}{6}$
13. $\dfrac{\pi}{2}$
14. $\dfrac{G}{n}$
15. 1
16. $\sqrt{\pi}(\sqrt{q}-\sqrt{p})$
17. $\dfrac{1+\ln(2)}{2}$
18. $-\dfrac{\pi}{2}\ln(2)$
19. $\dfrac{\pi^2}{16}$
20. 4950
21. 0
22. $\dfrac{\pi}{2}\ln\left(\dfrac{b}{a}\right)$
23. $\dfrac{\ln(3)}{2}$
24. $\dfrac{\pi^2}{4}$

25. $\dfrac{\ln(\pi) - \ln(2) + 1}{\pi}$

26. $\dfrac{\pi}{4}$

27. $\dfrac{\sqrt{\pi}}{e^2}$

28. $\dfrac{\pi^2}{4}$

29. $\dfrac{1}{\ln(2)}\left(\dfrac{2^{2024} - e + 1}{\ln(2)} - 2024\right)$

30. $\dfrac{\pi}{2}\ln(2)$