Integration Competition Answers

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1. 1

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

3. 2

4. $\ln\left(\dfrac{e}{\pi}\right)$

5:
$$\frac{\sqrt{2}}{4}\left(\ln\left|\frac{\tan u-\sqrt{2\tan u}+1}{\tan u+\sqrt{2\tan u}+1}\right|+2\arctan(\sqrt{2\tan u}-1)+2\arctan(\sqrt{2\tan u}+1)\right)$$

6. $\dfrac{\pi^2}{24}$

7. $6x^{\frac{1}{6}}-6\arctan(x^{\frac{1}{6}})$

8. $\dfrac{1}{2}$

9. $x-\arctan(\sqrt{x^2-1})+\sqrt{x^2-1}$

10. 1

11. $\dfrac{2(x^6+x^4+x^{-4})^{\frac{5}{4}}}{5}$

12. $\dfrac{\pi}{4}+\dfrac{\pi}{4e^2}$

13. $\ln\left|\dfrac{\sqrt{1+e^x}-1}{\sqrt{1+e^x}+1}\right|+2\sqrt{1+e^x}$

14. $\pi\ln 2$

15. $\dfrac{1}{2}\ln\left|\dfrac{\sqrt{1+e^{2x}}-1}{\sqrt{1+e^{2x}}+1}\right|$

16. $\pi \arcsin k$

17. 2π

18. $\ln \left| \frac{\tan\left(\frac{x}{2}\right) + 1}{\tan\left(\frac{x}{2}\right) + 3} \right|$

19. $\sum_{k=1}^{\infty} \frac{1}{k^k}$

20. $\frac{\pi^3}{8}$

21. $2\pi \ln \pi$

22. $\frac{1}{4}(\pi - 1)$

23. $\frac{\pi^2}{12} - \frac{1}{2}$

24. $\frac{(4x-3)^{\frac{3}{2}}}{12} - \frac{x}{2}$

25. $\pi \ln \left(\frac{a + \sqrt{a^2 - b^2}}{2} \right)$

26. $\frac{1}{2}(x \sin(\ln x) + x \cos(\ln x))$

27. $\frac{\pi^2}{4}$

28. $2 - \frac{\pi^2}{6}$

29. $\sqrt{x^2+1}\ln(x+\sqrt{x^2+1})-x$

30. $2\pi\sqrt{2}$

31. $4\left(\sin\frac{x}{4}-\cos\frac{x}{4}\right)$

32. $(\ln 2)^2-2\ln 2+2-\frac{\pi^2}{6}$

33. $\frac{\pi}{2}-\ln 2$

34. e^{e^x}

35. $\frac{\pi^2}{4}$

36. $\frac{1}{4}\arctan\left(\frac{x^2}{2}\right)$

37. $2\arctan\sqrt{x-1}$

38. $\frac{\pi}{4}$

39. $\frac{\pi^2}{6}$

40. $\frac{\pi\ln 2}{8}$