

Topic 11: Exercises on Integration
Level 2

1. Find $\int e^x \sin(e^x) dx$.

$$-\cos(e^x) + c$$

2. Find $\int \tan^3 x \sec^2 x dx$.

$$\frac{1}{4} \{\tan x\}^4 + c$$

3. Find $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$.

$$2e^{\sqrt{x}} + c$$

4. Evaluate $\int_1^e \cos(\ln x) \frac{1}{x} dx$.

$$\sin 1$$

5. Evaluate $\int_{\sqrt{2}}^3 \frac{1}{\sqrt{(x^2-1)}} dx$.

$$\ln(1+\sqrt{2})$$

6. Evaluate $\int_0^{\ln 3} \frac{e^x}{1+e^x} dx$.

$$\ln 2$$

7. Find $\int \frac{x(2x+1)}{x+1} dx$.

$$x^2 - x + \ln|x+1| + c$$

8. Find $\int \frac{x+1}{x(2x+1)} dx$.

$$\ln\left(\frac{x}{\sqrt{2x+1}}\right) + c$$

9. Find $\int \frac{2x+3}{x^2+2x+5} dx$.

$$\ln(x^2 + 2x + 5) + \frac{1}{2} \tan^{-1}\left(\frac{x+1}{2}\right) + c$$

10. Find $\int \frac{10}{(x-1)(x^2+9)} dx$

$$\ln \left| \frac{x-1}{\sqrt{x^2+9}} \right| - \frac{1}{3} \tan^{-1} \frac{x}{3} + c$$

11. If $I_n = \int_0^{\pi/2} x^n \cos x dx$ for $n \geq 0$, show that $I_n = \left(\frac{\pi}{2}\right)^n - n(n-1)I_{n-2}$ for $n \geq 2$. Hence evaluate I_6 .

$$I_6 = \frac{\pi^6}{64} - \frac{15}{8}\pi^4 + 90\pi^2 - 720$$