

1 By choosing a suitable method of integration, find:

a  $\int (2x - 3)^7 dx$

b  $\int x\sqrt{4x-1} dx$

c  $\int \sin^2 x \cos x dx$

d  $\int x \ln x dx$

e  $\int \frac{4 \sin x \cos x}{4 - 8 \sin^2 x} dx$

f  $\int \frac{1}{3 - 4x} dx$

2 By choosing a suitable method, evaluate the following definite integrals. Write your answers as exact values.

a  $\int_{-3}^0 x(x^2 + 3)^5 dx$

b  $\int_0^{\frac{\pi}{4}} x \sec^2 x dx$

c  $\int_1^4 \left(16x^{\frac{3}{2}} - \frac{2}{x}\right) dx$

d  $\int_{\frac{\pi}{12}}^{\frac{\pi}{3}} (\cos x + \sin x)(\cos x - \sin x) dx$

e  $\int_1^4 \frac{4}{16x^2 + 8x - 3} dx$

f  $\int_0^{\ln 2} \frac{1}{1 + e^x} dx$

**(E/P)** 3 a Show that  $\int_1^e \frac{1}{x^2} \ln x dx = 1 - \frac{2}{e}$  **(5 marks)**

b Given that  $p > 1$ , show that  $\int_1^p \frac{1}{(x+1)(2x-1)} dx = \frac{1}{3} \ln \frac{4p-2}{p+1}$  **(5 marks)**

**(E/P)** 4 Given  $\int_{\frac{1}{2}}^b \left(\frac{2}{x^3} - \frac{1}{x^2}\right) dx = \frac{9}{4}$ , find the value of  $b$ . **(4 marks)**

**(E/P)** 5 Given  $\int_0^\theta \cos x \sin^3 x dx = \frac{9}{64}$ , where  $\theta > 0$ , find the smallest possible value of  $\theta$ . **(4 marks)**

**(E)** 6 Using the substitution  $t^2 = x + 1$ , where  $x > -1$ ,

a find  $\int \frac{x}{\sqrt{x+1}} dx$ . **(5 marks)**

b Hence evaluate  $\int_0^3 \frac{x}{\sqrt{x+1}} dx$ . **(2 marks)**