1 **a** Express $\frac{3x+5}{(x+1)(x+3)}$ in partial fractions.

b Hence, find $\int \frac{3x+5}{(x+1)(x+3)}\,\mathrm{d}x$.

2 Show that $\int \frac{3}{(t-2)(t+1)}\,\mathrm{d}t = \ln\left|\frac{t-2}{t+1}\right| + c$.

3 Integrate with respect to x

a $\frac{6x-11}{(2x+1)(x-3)}$ **b** $\frac{14-x}{x^2+2x-8}$ **c** $\frac{6}{(2+x)(1-x)}$ **d** $\frac{x+1}{5x^2-14x+8}$

4 **a** Find the values of the constants A, B and C such that

$$\frac{x^2-6}{(x+4)(x-1)} \equiv A + \frac{B}{x+4} + \frac{C}{x-1}.$$

b Hence, find $\int \frac{x^2-6}{(x+4)(x-1)}\,\mathrm{d}x$.

5 **a** Express $\frac{x^2-x-4}{(x+2)(x+1)^2}$ in partial fractions.

b Hence, find $\int \frac{x^2-x-4}{(x+2)(x+1)^2}\,\mathrm{d}x$.

6 Integrate with respect to x

a $\frac{3x^2-5}{x^2-1}$ **b** $\frac{x(4x+13)}{(2+x)^2(3-x)}$ **c** $\frac{x^2-x+1}{x^2-3x-10}$ **d** $\frac{2-6x+5x^2}{x^2(1-2x)}$

7 Show that $\int_3^4 \frac{3x-5}{(x-1)(x-2)}\,\mathrm{d}x = 2\ln 3 - \ln 2$.

8 Find the exact value of

a $\int_1^3 \frac{x+3}{x(x+1)}\,\mathrm{d}x$ **b** $\int_0^2 \frac{3x-2}{x^2+x-12}\,\mathrm{d}x$ **c** $\int_1^2 \frac{9}{2x^2-7x-4}\,\mathrm{d}x$

d $\int_0^2 \frac{2x^2-7x+7}{x^2-2x-3}\,\mathrm{d}x$ **e** $\int_0^1 \frac{5x+7}{(x+1)^2(x+3)}\,\mathrm{d}x$ **f** $\int_{-1}^1 \frac{2+x}{8-2x-x^2}\,\mathrm{d}x$

9 **a** Express $\frac{1}{x^2-a^2}$, where a is a positive constant, in partial fractions.

b Hence, show that $\int \frac{1}{x^2-a^2}\,\mathrm{d}x = \frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right| + c$.

c Find $\int \frac{1}{a^2-x^2}\,\mathrm{d}x$.

10 Evaluate

a $\int_{-1}^1 \frac{1}{x^2-9}\,\mathrm{d}x$ **b** $\int_{-\frac{1}{2}}^{\frac{1}{2}} \frac{4}{1-x^2}\,\mathrm{d}x$ **c** $\int_0^1 \frac{3}{2x^2-8}\,\mathrm{d}x$