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

    b Hence, find $\displaystyle\int \dfrac{3x+5}{(x+1)(x+3)}\ dx$.

2 Show that $\displaystyle\int \dfrac{3}{(t-2)(t+1)}\ dt = \ln\left|\dfrac{t-2}{t+1}\right| + c$.

3 Integrate with respect to x

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

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

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

    b Hence, find $\displaystyle\int \dfrac{x^2-6}{(x+4)(x-1)}\ dx$.

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

    b Hence, find $\displaystyle\int \dfrac{x^2-x-4}{(x+2)(x+1)^2}\ dx$.

6 Integrate with respect to x

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

7 Show that $\displaystyle\int_3^4 \dfrac{3x-5}{(x-1)(x-2)}\ dx = 2\ln 3 - \ln 2$.

8 Find the exact value of

    a $\displaystyle\int_1^3 \dfrac{x+3}{x(x+1)}\ dx$ **b** $\displaystyle\int_0^2 \dfrac{3x-2}{x^2+x-12}\ dx$ **c** $\displaystyle\int_1^2 \dfrac{9}{2x^2-7x-4}\ dx$

    d $\displaystyle\int_0^2 \dfrac{2x^2-7x+7}{x^2-2x-3}\ dx$ **e** $\displaystyle\int_0^1 \dfrac{5x+7}{(x+1)^2(x+3)}\ dx$ **f** $\displaystyle\int_{-1}^1 \dfrac{2+x}{8-2x-x^2}\ dx$

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

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

    c Find $\displaystyle\int \dfrac{1}{a^2-x^2}\ dx$.

10 Evaluate

    a $\displaystyle\int_{-1}^1 \dfrac{1}{x^2-9}\ dx$ **b** $\displaystyle\int_{-\frac{1}{2}}^{\frac{1}{2}} \dfrac{4}{1-x^2}\ dx$ **c** $\displaystyle\int_0^1 \dfrac{3}{2x^2-8}\ dx$