

1 Find the quotient and remainder obtained in dividing

a  $(3x^3 - 10x^2 - 9x + 15)$  by  $(x - 4)$

b  $(2x^3 - 11x^2 - x + 3)$  by  $(2x - 1)$

c  $(4x^3 + 8x^2 + 7x + 32)$  by  $(2x + 5)$

d  $(1 - 22x^2 - 6x^3)$  by  $(3x + 2)$

2 a Show that  $(x + 2)$  is a factor of  $(x^3 + 4x^2 + x - 6)$ .

b Fully factorise  $x^3 + 4x^2 + x - 6$ .

c Simplify  $\frac{x^3 + 4x^2 + x - 6}{x^2 - 9}$ .

3 a Show that  $(2x - 3)$  is a factor of  $(2x^3 - 5x^2 + 13x - 15)$ .

b Simplify  $\frac{2x^3 - 5x^2 + 13x - 15}{2x^2 - 7x + 6}$ .

4 a State a linear factor of  $x^3 - 1$ .

b Simplify  $\frac{x^3 - 1}{x^2 + x - 2}$ .

5 Find the integers  $A$  and  $B$  such that

$$\frac{2x+5}{x+3} \equiv A + \frac{B}{x+3}.$$

6 Express each of the following in the form  $A + \frac{B}{f(x)}$ , where  $f(x)$  is linear.

a  $\frac{x+2}{x+1}$

b  $\frac{x+3}{x-2}$

c  $\frac{x}{1-x}$

d  $\frac{2x+1}{x+2}$

e  $\frac{x-1}{2x-1}$

f  $\frac{1-4x}{3+2x}$

7 Find the quotient and remainder obtained in dividing

a  $(x^2 + 3x + 5)$  by  $(x^2 + x + 2)$

b  $(2x^2 + 3x - 8)$  by  $(x^2 - x - 4)$

c  $(x^2 + 7)$  by  $(x^2 + 3x - 1)$

d  $(3x^2 - x - 4)$  by  $(x^2 + 2)$

e  $(x^3 - 2x^2 - 5x + 8)$  by  $(x^2 + x - 2)$

f  $(2x^3 - 7x^2 + 1)$  by  $(x^2 - 5x + 1)$

g  $(3x^3 + 6x^2 - 2x + 5)$  by  $(3x^2 + 4)$

h  $(6x^3 - x^2 - 44x - 6)$  by  $(2x^2 - 5x - 2)$

8 a Divide  $(x^3 + 5x^2 + 7x - 13)$  by  $(x^2 + 3x - 4)$ .

b Hence show that

$$\frac{x^3 + 5x^2 + 7x - 13}{x^2 + 3x - 4} \equiv x + 2 + \frac{5}{x + 4}.$$

9  $f(x) = \frac{x^3 - 2x^2 - 21x + 70}{x^2 + 2x - 15}$ ,  $x \neq 3$ .

a Express  $f(x)$  in the form  $Ax + B + \frac{C}{g(x)}$ , where  $g(x)$  is linear.

b Hence, or otherwise, solve the equation  $f(x) = \frac{3x-7}{x-3}$ .