

## 1 Simplify

a  $\frac{3x-1}{18x-6}$

b  $\frac{6x+15}{8x+20}$

c  $\frac{3y+3}{y^2+7y+6}$

d  $\frac{x^2-25}{x^2-7x+10}$

e  $\frac{a^2-a-6}{a^2+3a-18}$

f  $\frac{x^2+3x}{2x^2+5x-3}$

g  $\frac{3t^2-11t-4}{t^2-16}$

h  $\frac{6x^2-13x+6}{12x^2+x-6}$

## 2 Express as simply as possible

a  $\frac{3x^2}{9x-9} \times \frac{4x-4}{2x}$

b  $\frac{x^2-36}{x^2+7x+10} \div \frac{x-6}{x+2}$

c  $\frac{n^2+2n}{n^2+6n+8} \times \frac{n+4}{n^2}$

d  $\frac{4x-12}{x^2-4} \times \frac{x^2+2x}{x^2-2x-3}$

e  $\frac{4y^2}{2y^2+y} \div \frac{y^2+2y-15}{2y^2+11y+5}$

f  $\frac{x^2-1}{2x^2+7x-4} \times \frac{6x^2-5x+1}{3x^2-4x+1}$

g  $\frac{10x-10}{5x+15} \div \frac{4-3x-x^2}{x^2+7x+12}$

h  $\frac{a^3-3a^2}{8a^2-4a} \div \frac{a^2-9}{2a^2+5a-3}$

## 3 Express as a single fraction in its simplest form

a  $\frac{2}{y} + \frac{7}{y+4}$

b  $\frac{2x}{x-5} - \frac{1}{x+3}$

c  $\frac{7}{x(x+2)} - \frac{3x}{x+2}$

d  $\frac{x}{(x-3)(x-1)} + \frac{5}{2(x-1)}$

e  $\frac{2}{q^2+3q} + \frac{5q}{4q+12}$

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

g  $\frac{4}{x+5} + \frac{x}{x^2+8x+15}$

h  $\frac{6x}{x^2-4} - \frac{3}{x+2}$

i  $\frac{5t+12}{2t^2+7t+3} - \frac{4}{2t+1}$

## 4 Simplify

a  $\frac{x^2-5x}{6x-30}$

b  $\frac{16-x^2}{x^2+2x-8}$

c  $\frac{2x^2-4x-6}{3x^2-12x+9}$

d  $\frac{x^3-x}{2x^2-x-1}$

e  $\frac{3x-x^2}{2x^2-18}$

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

g  $\frac{2+5x-3x^2}{2x^2+x-10}$

h  $\frac{x^4-5x^2+4}{x^2-x-2}$

## 5 Express as simply as possible

a  $\frac{10x^2-10}{5x+10} \times \frac{x^2+6x+8}{x^2+5x+4}$

b  $\frac{t^2-2t}{2t^2-t-6} \div \frac{9t^2-4}{6t^2+13t+6}$

c  $\frac{2x^2+12x+10}{4x^2-7x+3} \div \frac{4x^2+20x}{4x^2-3x}$

d  $\frac{8x^2+6x-9}{4x^2+12x+9} \times \frac{2x^2+3x}{6-8x}$

e  $\frac{x^4+6x^2+5}{x^2-9} \times \frac{2x^2-6x}{4x^2+4}$

f  $\frac{y^4-16}{5y^2+9y-2} \div \frac{y^2+4}{25y^2-10y+1}$

6 Express as a single fraction in its simplest form

a  $\frac{5}{x^2-1} - \frac{1}{2x+2}$

b  $\frac{3x}{x^2-4} - \frac{4}{2x^2+3x-2}$

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

d  $\frac{x+1}{x^2-25} + \frac{2}{x^2+5x}$

e  $\frac{2x-1}{x^2+4x+4} + \frac{x}{3x+6}$

f  $\frac{1}{x-3} + \frac{3}{x^2-3x} + \frac{x}{x^2-6x+9}$

g  $\frac{x}{x^2-x-6} + \frac{2}{2x^2+3x-2}$

h  $\frac{1}{x^2} - \frac{1}{3x^2-2x} + \frac{3}{6x-4}$

7 Solve

a  $1 - \frac{2}{x} = \frac{3}{2x-5}$

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

c  $\frac{20}{2x^2+5x+2} + 1 = \frac{10}{2x+1}$

d  $\frac{y+3}{y+5} - \frac{1}{2} = \frac{2y-1}{y}$

e  $5 + \frac{1}{x^2+5x+6} = \frac{11}{x+3}$

f  $\frac{3}{1-4x+4x^2} - \frac{10}{1-4x^2} = \frac{5}{1+2x}$

8  $f(x) \equiv \frac{7x-15}{x^2-5x} - \frac{4}{x-5}, \quad 0 < x < 5.$

Show that  $f(x) = \frac{k}{x}$ , where  $k$  is an integer to be found.

9  $f(x) \equiv \frac{x-5}{3x^2+5x-2} + \frac{2}{3x-1}, \quad x > 1.$

Show that  $f(x) = \frac{1}{x+2}$ .

10 Given that  $f(x) \equiv \frac{x+2}{x-2}$ ,  $x \neq \pm 2$ , show that  $f(x) - \frac{1}{f(x)} = \frac{8x}{x^2-4}$ .

11 a Express  $\frac{2}{x+5} + \frac{3}{(x+2)(x+5)}$  as a single fraction in its simplest form.

b Hence solve the equation

$$\frac{2}{x+5} + \frac{3}{(x+2)(x+5)} = \frac{1}{3},$$

giving your answers to 2 decimal places.

12 Show that the equation  $\frac{3}{4x+2} - \frac{5}{4x^2+4x+1} = 2$  has no real roots.

13 Express  $\left(\frac{6}{x+5} - \frac{1}{x}\right) \div \frac{x-1}{x^2-25}$  as a single fraction in its simplest form.