

RATIONAL EXPRESSIONS

1 Simplify

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

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

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

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

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

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

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

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

2 Express as simply as possible

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

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

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

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

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

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

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

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

3 Express as a single fraction in its simplest form

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

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

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

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

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

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

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

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

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

4 Simplify

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

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

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

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

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

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

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

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

5 Express as simply as possible

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

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

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

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

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

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

RATIONAL EXPRESSIONS

continued

6 Express as a single fraction in its simplest form

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

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

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

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

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

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

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

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

7 Solve

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

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

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

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

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

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

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

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

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

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

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

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

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.

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

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