

Exercise 1D

ALGEBRAIC FRACTIONS EXERCISES :

1. Simplify:

(a) $\frac{x}{2x}$

(c) $\frac{3x^2}{9xy}$

(e) $\frac{12xy^2z}{15x^2yz^2}$

(b) $\frac{a}{a^2}$

(d) $\frac{12ab}{4a^2b}$

(f) $\frac{uvw^2}{u^3v^2w}$

2. Simplify:

(a) $\frac{x}{3} \times \frac{3}{x}$

(d) $\frac{a^2}{2b} \times \frac{b^2}{a^2}$

(g) $\frac{5}{a} \div 10$

(j) $\frac{2a}{3b} \times \frac{5c^2}{2a^2b} \times \frac{3b^2}{2c}$

(b) $\frac{a}{4} \div \frac{a}{2}$

(e) $\frac{3x^2}{4y^2} \times \frac{2y}{x}$

(h) $\frac{2ab}{3c} \times \frac{c^2}{ab^2}$

(k) $\frac{12x^2yz}{8xy^3} \times \frac{24xy^2}{36yz^2}$

(c) $x \times \frac{3}{x^2}$

(f) $\frac{x^2}{3ay^3} \div \frac{x^2}{3ay^3}$

(i) $\frac{8a^3b}{5} \div \frac{4ab}{15}$

(l) $\frac{3a^2b}{4b^3c} \times \frac{2c^2}{8a^3} \div \frac{6ac}{16b^2}$

3. Write as a single fraction:

(a) $\frac{x}{2} + \frac{x}{5}$

(d) $\frac{2a}{3} + \frac{3a}{2}$

(g) $\frac{1}{x} + \frac{1}{2x}$

(j) $x + \frac{1}{x}$

(b) $\frac{a}{3} - \frac{a}{6}$

(e) $\frac{7b}{10} - \frac{19b}{30}$

(h) $\frac{3}{4x} + \frac{4}{3x}$

(k) $a + \frac{b}{a}$

(c) $\frac{x}{8} - \frac{y}{12}$

(f) $\frac{xy}{30} - \frac{xy}{18}$

(i) $\frac{1}{a} - \frac{1}{b}$

(l) $\frac{1}{2x} - \frac{1}{x^2}$

4. Simplify:

(a) $\frac{x+1}{2} + \frac{x+2}{3}$

(e) $\frac{x-5}{3x} - \frac{x-3}{5x}$

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

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

(f) $\frac{1}{x} - \frac{1}{x+1}$

(j) $\frac{x}{x+y} + \frac{y}{x-y}$

(c) $\frac{2x+1}{3} - \frac{x-5}{6} + \frac{x+4}{4}$

(g) $\frac{1}{x+1} - \frac{1}{x+1}$

(k) $\frac{a}{x+a} - \frac{b}{x+b}$

(d) $\frac{3x-7}{5} + \frac{4x+3}{2} - \frac{2x-5}{10}$

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

(l) $\frac{x}{x-1} - \frac{x}{x+1}$

5. Factor where possible and then simplify:

(a) $\frac{a}{ax+ay}$

(d) $\frac{a^2-9}{a^2+a-12}$

(g) $\frac{ac+ad+bc+bd}{a^2+ab}$

(b) $\frac{3a^2-6ab}{2a^2b-4ab^2}$

(e) $\frac{x^2+2xy+y^2}{x^2-y^2}$

(h) $\frac{y^2-8y+15}{2y^2-5y-3}$

(c) $\frac{x^2+2x}{x^2-4}$

(f) $\frac{x^2+10x+25}{x^2+9x+20}$

(i) $\frac{9ax+6bx-6ay-4by}{9x^2-4y^2}$

6. Simplify:

(a) $\frac{3x+3}{2x} \times \frac{x^2}{x^2-1}$

(d) $\frac{x^2-x-20}{x^2-25} \times \frac{x^2-x-2}{x^2+2x-8} \div \frac{x+1}{x^2+5x}$

(b) $\frac{a^2+a-2}{a+2} \times \frac{a^2-3a}{a^2-4a+3}$

(e) $\frac{ax+bx-2a-2b}{3x^2-5x-2} \times \frac{9x^2-1}{a^2+2ab+b^2}$

(c) $\frac{c^2+5c+6}{c^2-16} \div \frac{c+3}{c-4}$

(f) $\frac{2x^2+x-15}{x^2+3x-28} \div \frac{x^2+6x+9}{x^2-4x} \div \frac{6x^2-15x}{x^2-49}$

7. Simplify:

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

(d) $\frac{3}{x^2+2x-8} - \frac{2}{x^2+x-6}$

(b) $\frac{1}{x^2-4} + \frac{1}{x^2-4x+4}$

(e) $\frac{x}{a^2-b^2} - \frac{x}{a^2+ab}$

(c) $\frac{1}{x-y} + \frac{2x-y}{x^2-y^2}$

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

8. Simplify:

(a) $\frac{b-a}{a-b}$

(c) $\frac{x^2 - 5x + 6}{2-x}$

(e) $\frac{m}{m-n} + \frac{n}{n-m}$

(b) $\frac{v^2 - u^2}{u-v}$

(d) $\frac{1}{a-b} - \frac{1}{b-a}$

(f) $\frac{x-y}{y^2 + xy - 2x^2}$

DEVELOPMENT

9. Study the worked exercise on compound fractions and then simplify:

(a) $\frac{1 - \frac{1}{2}}{1 + \frac{1}{2}}$

(c) $\frac{\frac{1}{2} - \frac{1}{5}}{1 + \frac{1}{10}}$

(e) $\frac{\frac{1}{x}}{1 + \frac{2}{x}}$

(g) $\frac{1}{\frac{1}{b} + \frac{1}{a}}$

(i) $\frac{1 - \frac{1}{x+1}}{\frac{1}{x} + \frac{1}{x+1}}$

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

(d) $\frac{\frac{17}{20} - \frac{3}{4}}{\frac{4}{5} - \frac{3}{10}}$

(f) $\frac{t - \frac{1}{t}}{t + \frac{1}{t}}$

(h) $\frac{\frac{x}{y} + \frac{y}{x}}{\frac{x}{y} - \frac{y}{x}}$

(j) $\frac{\frac{3}{x+2} - \frac{2}{x+1}}{\frac{5}{x+2} - \frac{4}{x+1}}$

10. If $x = \frac{1}{\lambda}$ and $y = \frac{1}{1-x}$ and $z = \frac{y}{y-1}$, show that $z = \lambda$.

11. Simplify:

(a) $\frac{x^4 - y^4}{x^2 - 2xy + y^2} \div \frac{x^2 + y^2}{x-y}$

(b) $\frac{8x^2 + 14x + 3}{8x^2 - 10x + 3} \times \frac{12x^2 - 6x}{4x^2 + 5x + 1} \div \frac{18x^2 - 6x}{4x^2 + x - 3}$

(c) $\frac{(a-b)^2 - c^2}{ab - b^2 - bc} \times \frac{c}{a^2 + ab - ac} \div \frac{ac - bc + c^2}{a^2 - (b-c)^2}$

(d) $\frac{x-y}{x} + \frac{x^3 + y^3}{xy^2} - \frac{x^2 + y^2}{x^2}$

(e) $\frac{x+4}{x-4} - \frac{x-4}{x+4}$

(f) $\frac{4y}{x^2 + 2xy} - \frac{3x}{xy + 2y^2} + \frac{3x - 2y}{xy}$

(g) $\frac{8x}{x^2 + 5x + 6} - \frac{5x}{x^2 + 3x + 2} - \frac{3x}{x^2 + 4x + 3}$

(h) $\frac{1}{x-1} + \frac{2}{x+1} - \frac{3x-2}{x^2-1} - \frac{1}{x^2+2x+1}$

12. (a) Expand $\left(x + \frac{1}{x}\right)^2$.

(b) Suppose that $x + \frac{1}{x} = 3$. Use part (a) to evaluate $x^2 + \frac{1}{x^2}$ without attempting to find the value of x .

(ANSWERS)

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1(a) $\frac{1}{2}$ (b) $\frac{1}{a}$ (c) $\frac{x}{3y}$ (d) $\frac{3}{a}$ (e) $\frac{4y}{5xz}$ (f) $\frac{w}{u^2v}$

2(a) 1 (b) $\frac{1}{2}$ (c) $\frac{3}{x}$ (d) $\frac{b}{2}$ (e) $\frac{3x}{2y}$ (f) 1 (g) $\frac{1}{2a}$

(h) $\frac{2c}{3b}$ (i) $6a^2$ (j) $\frac{5c}{2a}$ (k) $\frac{x^2}{yz}$ (l) $\frac{1}{2a^2}$

3(a) $\frac{7x}{10}$ (b) $\frac{a}{6}$ (c) $\frac{3x-2y}{24}$ (d) $\frac{13a}{6}$ (e) $\frac{b}{15}$ (f) $-\frac{xy}{45}$

(g) $\frac{3}{2x}$ (h) $\frac{25}{12x}$ (i) $\frac{b-a}{ab}$ (j) $\frac{x^2+1}{x}$ (k) $\frac{a^2+b}{a}$ (l) $\frac{x-2}{2x^2}$

4(a) $\frac{5x+7}{6}$ (b) $-\frac{x-17}{10}$ (c) $\frac{9x+26}{12}$ (d) $\frac{12x+3}{5}$

(e) $\frac{2x-16}{15x}$ (f) $\frac{1}{x(x+1)}$ (g) $\frac{2x}{x^2-1}$ (h) $\frac{5x-13}{(x-2)(x-3)}$

(i) $\frac{-10}{(x+3)(x-2)}$ (j) $\frac{x^2+y^2}{x^2-y^2}$ (k) $\frac{ax-bx}{(x+a)(x+b)}$ (l) $\frac{2x}{x^2-1}$

5(a) $\frac{1}{x+y}$ (b) $\frac{3}{2b}$ (c) $\frac{x}{x-2}$ (d) $\frac{a+3}{a+4}$ (e) $\frac{x+y}{x-y}$

(f) $\frac{x+5}{x+4}$ (g) $\frac{c+d}{a}$ (h) $\frac{y-5}{2y+1}$ (i) $\frac{3a+2b}{3x+2y}$

6(a) $\frac{3x}{2(x-1)}$ (b) a (c) $\frac{c+2}{c+4}$ (d) x (e) $\frac{3x-1}{a+b}$ (f) $\frac{x-7}{3(x+3)}$

7(a) $\frac{2}{x^2-1}$ (b) $\frac{2x}{(x-2)^2(x+2)}$ (c) $\frac{3x}{x^2-y^2}$

(d) $\frac{x+1}{(x-2)(x+3)(x+4)}$ (e) $\frac{bx}{a(a-b)(a+b)}$

(f) $\frac{x}{(x-1)(x-2)(x-3)}$

8(a) -1 (b) $-u-v$ (c) $3-x$ (d) $\frac{2}{a-b}$ (e) 1

(f) $\frac{-1}{2x+y}$

9(a) $\frac{1}{3}$ (b) $\frac{7}{13}$ (c) $\frac{3}{11}$ (d) $\frac{1}{5}$ (e) $\frac{1}{x+2}$ (f) $\frac{t^2-1}{t^2+1}$

(g) $\frac{ab}{a+b}$ (h) $\frac{x^2+y^2}{x^2-y^2}$ (i) $\frac{x^2}{2x+1}$ (j) $\frac{x-1}{x-3}$

11(a) $x+y$ (b) $\frac{2x+3}{3x-1}$ (c) $\frac{a-b+c}{ab}$ (d) $\frac{x^4-y^4}{x^2y^2}$ (e) $\frac{16x}{x^2-16}$

(f) $\frac{4}{x+2y}$ (g) $\frac{-13x}{(x+1)(x+2)(x+3)}$ (h) $\frac{2}{(x+1)^2(x-1)}$

12(a) $x^2 + 2 + \frac{1}{x^2}$ (b) 7