

2.6 and 2.7 Full Solutions

① a)
$$\frac{2x^3}{3x^2-4x} \times \frac{6x-8}{2x-2}$$
$$= \frac{2x^3}{x(3x-4)} \times \frac{2(3x-4)}{2(x-1)}$$
$$= \frac{2x^2}{x-1}, \quad x \neq 0, 1, \frac{4}{3}$$

Restrictions

$$\begin{aligned} x &\neq 0 \\ 3x-4 &\neq 0 \\ \therefore x &\neq \frac{4}{3} \end{aligned}$$

$$\begin{aligned} x-1 &\neq 0 \\ \therefore x &\neq 1 \end{aligned}$$

b)
$$\frac{2x^2-3x}{x^2} \times \frac{x^2-3x-4}{2x^2-x-3}$$
$$= \frac{x(2x-3)}{x^2} \times \frac{(x-4)(x+1)}{(2x-3)(x+1)}$$
$$= \frac{x-4}{x}, \quad x \neq -1, 0, \frac{3}{2}$$

Restrictions

$$\begin{aligned} x^2 &\neq 0 \\ \therefore x &\neq 0 \\ 2x-3 &\neq 0 \\ \therefore x &\neq \frac{3}{2} \end{aligned}$$

$$\begin{aligned} x+1 &\neq 0 \\ \therefore x &\neq -1 \end{aligned}$$

c)
$$\frac{2x^2-13x+20}{x} \times \frac{x^2+4x-5}{x^2-5x+4}$$

$$\begin{aligned} 2x^2-13x+20 \\ 2x^2-8x-5x+20 \\ 2x(x-4)-5(x-4) \\ (2x-5)(x-4) \end{aligned}$$

$$= \frac{(2x-5)(x-4)}{x} \times \frac{(x+5)(x-1)}{(x-1)(x-4)}$$
$$= \frac{(2x-5)(x+5)}{x}, \quad x \neq 0, 1, 4$$

$$d) \frac{x^2-1}{x^2-4} \times \frac{x^2-3x+4}{x^2+5x+4}$$

$$= \frac{(x-1)(\cancel{x+1}) \times (x^2-3x+4)}{(x-2)(x+2) (x+1)(x+4)}$$

$$= \frac{(x-1)(x^2-3x+4)}{(x-2)(x+2)(x+4)}, \quad x \neq -4, -2, -1, 2$$

not factorable

② a) $\frac{x^2-4}{x+3} \div \frac{x^2-x-6}{x^2+x-6}$

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

$$= \frac{(x-2)(\cancel{x+2}) \times (\cancel{x+3})(x-2)}{(x+3) (x-3)(\cancel{x+2})}$$

$$= \frac{(x-2)(x-2)}{(x-3)}$$

$$= \frac{(x-2)^2}{x-3}, \quad x \neq -3, -2, 2, 3$$

Restrictions

* Given $\frac{A}{B} \div \frac{C}{D}$

restrictions come from B, C and D!

$\rightarrow x+3 \neq 0$
 $\therefore \underline{x \neq -3}$

$x-3 \neq 0$
 $\therefore \underline{x \neq 3}$

$x+2 \neq 0$
 $\therefore \underline{x \neq -2}$

$x-2 \neq 0$
 $\therefore \underline{x \neq 2}$

b) $\frac{x^2+2x-8}{x^2+x-6} \div \frac{x^2+3x-4}{x^2-9}$

$$= \frac{(x+4)(x-2)}{(x+3)(x-2)} \div \frac{(x+4)(x-1)}{(x-3)(x+3)}$$

$$= \frac{(\cancel{x+4})(\cancel{x-2}) \times (\cancel{x-3})(\cancel{x+3})}{(\cancel{x+3})(\cancel{x-2}) (x+4)(x-1)}$$

$$= \frac{x-3}{x-1}, \quad x \neq -4, -3, 1, 2, 3$$

Restrictions

$x \neq 2, -3$

$x \neq -4, 1$

$x \neq 3, -3$

$$c) \frac{x^2 + x}{3x^2 - 14x + 8} \div \frac{x^2 + 3x}{3x^2 - 10x - 8}$$

$$\begin{aligned} 3x^2 - 10x - 8 \\ = 3x^2 - 12x + 2x - 8 \\ = 3x(x-4) + 2(x-4) \\ = (3x+2)(x-4) \end{aligned}$$

$$\begin{aligned} & \frac{3x^2 - 14x + 8}{3x^2 - 12x - 2x + 8} \\ & \rightarrow \frac{3x(x-4) - 2(x-4)}{(3x-2)(x-4)} \\ & = \frac{x(x+1)}{(3x-2)(x-4)} \div \frac{x(x+3)}{(3x+2)(x-4)} \end{aligned}$$

$$= \frac{x(x+1)}{(3x-2)(x-4)} \times \frac{(3x+2)(x-4)}{x(x+3)}$$

$$= \frac{(x+1)(3x+2)}{(3x-2)(x+3)}, \quad x \neq -3, -\frac{2}{3}, 0, \frac{2}{3}, 4$$

Restrictions

$$x \neq 0$$

$$x+3 \neq 0$$

$$x \neq -3$$

$$3x-2 \neq 0$$

$$x \neq \frac{2}{3}$$

$$x-4 \neq 0$$

$$x \neq 4$$

$$3x+2 \neq 0$$

$$x \neq -\frac{2}{3}$$

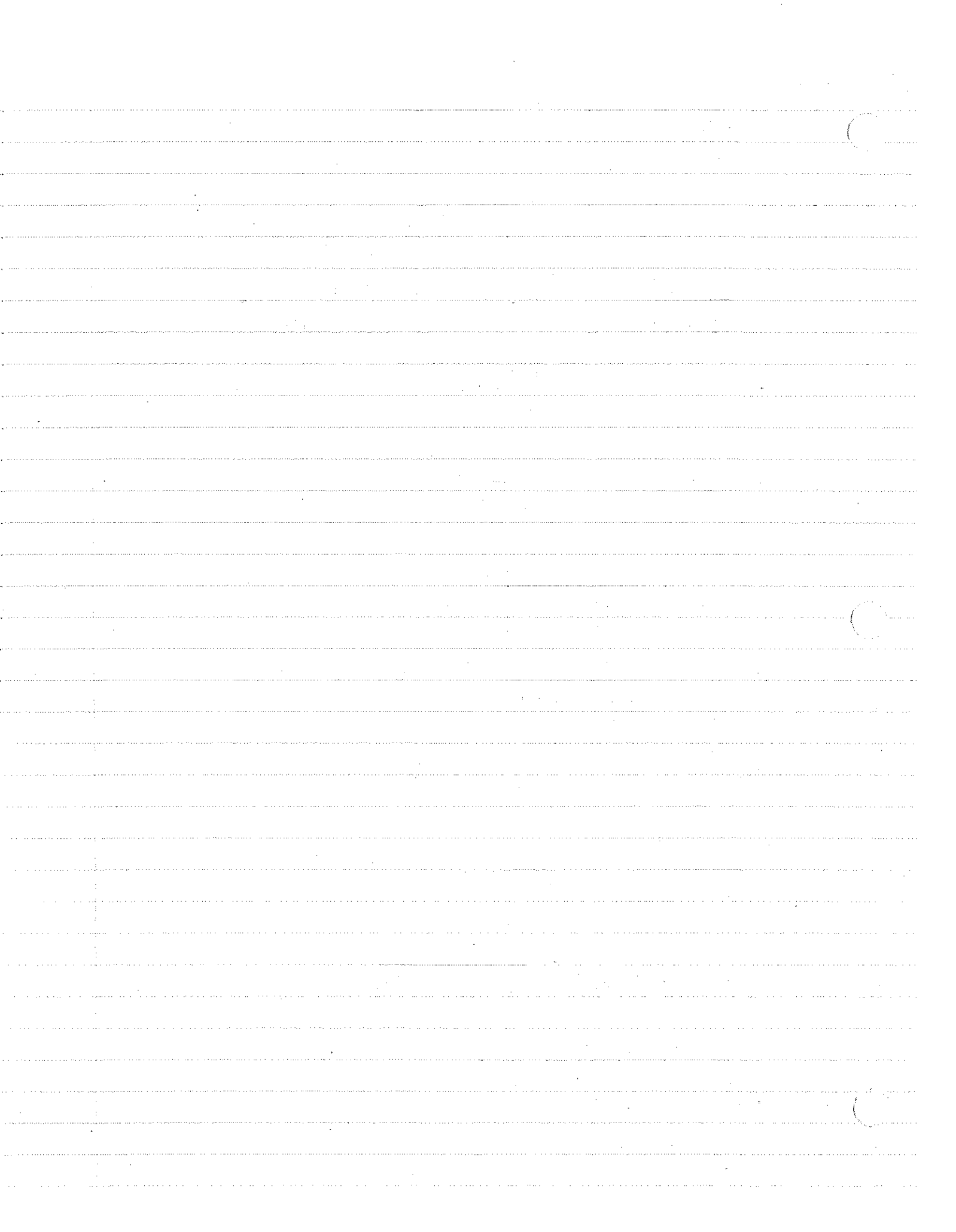
$$d) \frac{x^3 + 4x^2 + 3x}{2x^2 - 5x - 12} \div \frac{x^2 + 3x}{2x^2 + 9x + 9}$$

$$\begin{aligned} 2x^2 + 9x + 9 \\ = 2x^2 + 6x + 3x + 9 \\ = 2x(x+3) + 3(x+3) \\ = (2x+3)(x+3) \end{aligned}$$

$$\begin{aligned} & \frac{2x^2 - 5x - 12}{2x^2 - 8x + 3x - 12} \\ & \rightarrow \frac{2x(x-4) + 3(x-4)}{(2x+3)(x-4)} \\ & = \frac{x(x^2 + 4x + 3)}{(2x+3)(x-4)} \div \frac{x(x+3)}{(2x+3)(x+3)} \end{aligned}$$

$$= \frac{x(x+3)(x+1)}{(2x+3)(x-4)} \times \frac{(2x+3)(x+3)}{x(x+3)}$$

$$= \frac{(x+1)(x+3)}{x-4}, \quad x \neq -3, -\frac{3}{2}, 0, 4$$



$$c) \frac{3x-1}{2x^2-7x-4} + \frac{2x-3}{2x^2+3x+1}$$

$$\begin{aligned} 2x^2-7x-4 \\ 2x^2-8x+x-4 \\ 2x(x-4)+1(x-4) \\ = (2x+1)(x-4) \end{aligned}$$

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

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

$$= \frac{3x^2+3x-x-1 + 2x^2-8x-3x+12}{(2x+1)(x-4)(x+1)}$$

$$= \frac{5x^2-9x+11}{(2x+1)(x-4)(x+1)} \leftarrow \text{not factorable}$$

$$= \frac{5x^2-9x+11}{(2x+1)(x-4)(x+1)}, x \neq -1, -\frac{1}{2}, 4$$

$$d) \frac{2x-1}{x^2+3x+2} - \frac{2x+2}{x^2+5x+6}$$

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

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

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

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

4

$$a) \frac{4}{2x-1} + \frac{2}{1-2x}$$

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

$$= \frac{4-2}{2x-1}$$

$$= \frac{2}{2x-1}, \quad x \neq \frac{1}{2}$$

$$b) \frac{3x}{x-7} - \frac{x}{7-x}$$

$$= \frac{3x}{x-7} - \frac{(-x)}{x-7}$$

$$= \frac{3x+x}{x-7}$$

$$= \frac{4x}{x-7}, \quad x \neq 7$$

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

$$= \frac{6x-1}{3x-4} + \frac{1-4x}{3x-4}$$

$$= \frac{6x-1+1-4x}{3x-4}$$

$$= \frac{2x}{3x-4}, \quad x \neq \frac{4}{3}$$

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

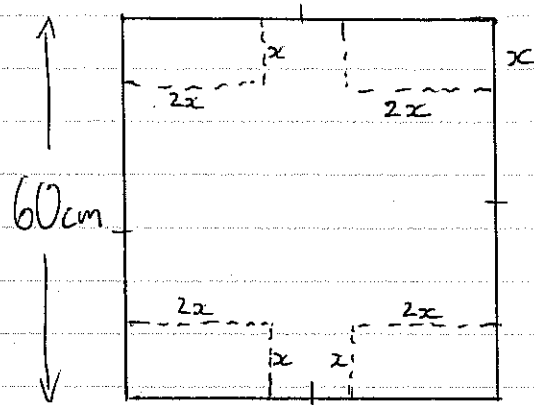
$$= \frac{5x+2}{5x-2} - \frac{(-3x)}{5x-2}$$

$$= \frac{5x+2+3x}{5x-2}$$

$$= \frac{8x+2}{5x-2}$$

$$= \frac{2(4x+1)}{5x-2}, \quad x \neq \frac{2}{5}$$

5



a) Length = $60 - x - x$
 $= \underline{60 - 2x}$
 Width = $60 - 2x - 2x$
 $= \underline{60 - 4x}$
 Height = \underline{x}

b) Volume = LWH
 $= (60 - 2x)(60 - 4x)(x)$
 $= 2(30 - x)4(15 - x)x$
 $= \underline{8x(30 - x)(15 - x)}$

c) Surface Area = $LW + 2WH + 2LH$
 $= (60 - 2x)(60 - 4x) + 2(60 - 4x)(x) + 2(60 - 2x)(x)$

d) $x > 0$, $2x + 2x < 60$
 $4x < 60$ $\therefore \underline{0 < x < 15}$
 $x < 15$

$\therefore x$ must be between 0 and 15 cm for a box to exist.

6

$\frac{x^2 + 5x + 6}{x + 3}$		$\frac{2x^2 + 3x - 2}{2x - 1}$
$= \frac{(x + 2)(x + 3)}{(x + 3)}$		$= \frac{(2x - 1)(x + 2)}{(2x - 1)}$
$= \underline{x + 2}, x \neq -3$		$= \underline{x + 2}, x \neq \frac{1}{2}$

\therefore They are not equivalent because they have different restrictions

