

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 2

MATHEMATICS 1090

FALL 2026

SOLUTIONS

- [1] 1. (a) Since $x > 0$, we know that $|x| = x$. Thus

$$\begin{aligned} |3x| + |-4x| &= |3| \cdot |x| + |-4| \cdot |x| \\ &= 3x + 4x \\ &= 7x. \end{aligned}$$

- [1] (b) Since $x < 0$, we know that $|x| = -x$. Thus

$$\begin{aligned} |3x| + |-4x| &= |3| \cdot |x| + |-4| \cdot |x| \\ &= 3(-x) + 4(-x) \\ &= -3x - 4x \\ &= -7x. \end{aligned}$$

- [2] (c) We can write

$$|6 - x| = \begin{cases} 6 - x, & \text{for } 6 - x \geq 0 \text{ so } x \leq 6 \\ -(6 - x), & \text{for } 6 - x < 0 \text{ so } x > 6. \end{cases}$$

We are given that $x > 6$ so $|6 - x| = -(6 - x) = x - 6$. Thus

$$\begin{aligned} 6x - |6 - x| &= 6x - (x - 6) \\ &= 5x + 6. \end{aligned}$$

- [5] 2. (a) Observe that

$$x^2 + 2x - 8 = (x + 4)(x - 2) \quad \text{and} \quad x^2 - x - 2 = (x + 1)(x - 2),$$

so the lowest common denominator is $(x+4)(x+1)(x-2)$. Thus we can write

$$\begin{aligned}
 \frac{4}{x^2+2x-8} - \frac{x}{x^2-x-2} &= \frac{4}{(x+4)(x-2)} - \frac{x}{(x+1)(x-2)} \\
 &= \frac{4}{(x+4)(x-2)} \cdot \frac{x+1}{x+1} - \frac{x}{(x+1)(x-2)} \cdot \frac{x+4}{x+4} \\
 &= \frac{4(x+1)}{(x+4)(x+1)(x-2)} - \frac{x(x+4)}{(x+4)(x+1)(x-2)} \\
 &= \frac{4(x+1) - x(x+4)}{(x+4)(x+1)(x-2)} \\
 &= \frac{4x+4-x^2-4x}{(x+4)(x+1)(x-2)} \\
 &= \frac{-x^2+4}{(x+4)(x+1)(x-2)} \\
 &= \frac{-(x^2-4)}{(x+4)(x+1)(x-2)} \\
 &= \frac{-(x-2)(x+2)}{(x+4)(x+1)(x-2)} \\
 &= -\frac{x+2}{(x+4)(x+1)}.
 \end{aligned}$$

[2] (b) We can write the numerator as

$$\begin{aligned}
 2 + \frac{3}{x^2-9} &= 2 + \frac{3}{(x-3)(x+3)} \\
 &= \frac{2}{1} \cdot \frac{(x-3)(x+3)}{(x-3)(x+3)} + \frac{3}{(x-3)(x+3)} \\
 &= \frac{2(x-3)(x+3) + 3}{(x-3)(x+3)} \\
 &= \frac{2(x^2-9) + 3}{(x-3)(x+3)} \\
 &= \frac{2x^2-15}{(x-3)(x+3)}.
 \end{aligned}$$

We can write the denominator as

$$\begin{aligned}
 5 + \frac{1}{x-3} &= \frac{5}{1} \cdot \frac{x-3}{x-3} + \frac{1}{x-3} \\
 &= \frac{5(x-3) + 1}{x-3} \\
 &= \frac{5x-14}{x-3}.
 \end{aligned}$$

Thus we have

$$\begin{aligned}\frac{2 + \frac{3}{x^2-9}}{5 + \frac{1}{x-3}} &= \frac{2x^2 - 15}{(x-3)(x+3)} \cdot \frac{x-3}{5x-14} \\ &= \frac{2x^2 - 15}{(x+3)(5x-14)}.\end{aligned}$$

[2] (c) We can write

$$\begin{aligned}4(x-2)^{-3} - (x-2)^{-2} &= \frac{4}{(x-2)^3} - \frac{1}{(x-2)^2} \\ &= \frac{4}{(x-2)^3} - \frac{1}{(x-2)^2} \cdot \frac{x-2}{x-2} \\ &= \frac{4}{(x-2)^3} - \frac{x-2}{(x-2)^3} \\ &= \frac{4 - (x-2)}{(x-2)^3} \\ &= \frac{6-x}{(x-2)^3}.\end{aligned}$$

[5] 3. (a) First we can write

$$\sqrt{48x^5} = \sqrt{16x^4 \cdot 3x} = \sqrt{16x^4} \cdot \sqrt{3x} = 4x^2\sqrt{3x}.$$

Next we can write

$$\sqrt{27x^3} = \sqrt{9x^2 \cdot 3x} = \sqrt{9x^2} \cdot \sqrt{3x} = 3x\sqrt{3x}.$$

Thus

$$\begin{aligned}2\sqrt{48x^5} + x\sqrt{27x^3} &= 2 \cdot 4x^2\sqrt{3x} + x \cdot 3x\sqrt{3x} \\ &= 8x^2\sqrt{3x} + 3x^2\sqrt{3x} \\ &= 11x^2\sqrt{3x}.\end{aligned}$$

[2] (b) Since this is a quotient involving radicals with the same index, we have

$$\begin{aligned}\frac{\sqrt[3]{243x^8}}{\sqrt[3]{9x}} &= \sqrt[3]{\frac{243x^8}{9x}} \\ &= \sqrt[3]{27x^7} \\ &= \sqrt[3]{27x^6 \cdot x} \\ &= 3x^2\sqrt[3]{x}.\end{aligned}$$