

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 3

MATHEMATICS 1090

FALL 2026

SOLUTIONS

- [1] 1. The conjugate of the denominator is $4 + 2\sqrt{11}$, so we write

$$\begin{aligned}\frac{21}{4 - 2\sqrt{11}} &= \frac{21}{4 - 2\sqrt{11}} \cdot \frac{4 + 2\sqrt{11}}{4 + 2\sqrt{11}} \\ &= \frac{21(4 + 2\sqrt{11})}{4^2 - (2\sqrt{11})^2} \\ &= \frac{42(2 + \sqrt{11})}{16 - 44} \\ &= \frac{42(2 + \sqrt{11})}{-28} \\ &= -\frac{3(2 + \sqrt{11})}{2}.\end{aligned}$$

- [1] 2. (a) We have

$$\begin{aligned}4x + 3 &= 12 - \frac{x}{2} \\ 4x + \frac{x}{2} &= 12 - 3 \\ \frac{9}{2}x &= 9 \\ x &= 9 \cdot \frac{2}{9} \\ &= 2.\end{aligned}$$

- [3] (b) Expanding the lefthand side, we have

$$\begin{aligned}3x(x - 1) &= x - 1 \\ 3x^2 - 3x &= x - 1 \\ 3x^2 - 4x + 1 &= 0 \\ (3x - 1)(x - 1) &= 0.\end{aligned}$$

Thus $3x - 1 = 0$ so $x = \frac{1}{3}$ or $x - 1 = 0$ so $x = 1$.

- [5] (c) We have two possibilities. First, we may have

$$\begin{aligned} 2x - 5 &= 4 - 3x \\ 5x &= 9 \\ x &= \frac{9}{5}. \end{aligned}$$

Alternatively, we may have

$$\begin{aligned} 2x - 5 &= -(4 - 3x) \\ &= 3x - 4 \\ -1 &= x. \end{aligned}$$

However, substitution of $x = \frac{9}{5}$ into the original equation gives

$$\left| 2 \left(\frac{9}{5} \right) - 5 \right| = \left| -\frac{7}{5} \right| = \frac{7}{5}$$

on the lefthand side and

$$4 - 3 \left(\frac{9}{5} \right) = 4 - \frac{27}{5} = -\frac{7}{5}$$

on the righthand side, so this is not a solution. On the other hand, substitution of $x = -1$ gives

$$|2(-1) - 5| = |-7| = 7$$

on the lefthand side and

$$4 - 3(-1) = 4 + 3 = 7$$

on the righthand side, so this is a solution. Hence the only solution of the equation is $x = -1$.

- [4] (d) We have

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

Now the numerators must be equal, so

$$2x - 3 = 5$$

$$2x = 8$$

$$x = 4.$$

Since the rational expressions in the original equation are undefined only for $x = 1$ and $x = 2$, we see that $x = 4$ is the only solution of the equation.

[6] (e) Squaring both sides yields

$$\sqrt{3 - x} = 3 - 2x$$

$$3 - x = (3 - 2x)^2$$

$$= 4x^2 - 12x + 9$$

$$0 = 4x^2 - 11x + 6$$

$$= (4x - 3)(x - 2).$$

Thus either $4x - 3 = 0$, so $x = \frac{3}{4}$, or $x - 2 = 0$, so $x = 2$. However, upon substitution into the original equation, we find that $x = 2$ gives

$$\sqrt{3 - 2} = \sqrt{1} = 1$$

on the lefthand side but

$$3 - 2(2) = 3 - 4 = -1$$

on the righthand side. Hence it is not a solution. On the other hand, $x = \frac{3}{4}$ gives

$$\sqrt{3 - \frac{3}{4}} = \sqrt{\frac{9}{4}} = \frac{3}{2}$$

on the lefthand side and

$$3 - 2\left(\frac{3}{4}\right) = 3 - \frac{3}{2} = \frac{3}{2}$$

on the righthand side. Thus the only solution of the equation is $x = \frac{3}{4}$.