

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 1.8

Math 1090 Worksheet

FALL 2026

SOLUTIONS

1. (a) We have

$$\begin{aligned}5 - |x - 2| &= 0 \\ |x - 2| &= 5.\end{aligned}$$

We now have two possibilities. If $x - 2 = 5$ then $x = 7$. On the other hand, if $x - 2 = -5$ then $x = -3$. Hence $x = 7$ and $x = -3$ are the two solutions of the equation.

- (b) We have

$$|x + 4| = 3 - x$$

so we again must examine two cases. If $x + 4 = 3 - x$ then $2x = -1$ and so $x = -\frac{1}{2}$. If $x + 4 = -(3 - x) = x - 3$ then $4 = -3$, which is impossible. Thus the only solution is $x = -\frac{1}{2}$.

2. (a) First observe that

$$\begin{aligned}\frac{2}{x-5} + \frac{1}{x+5} &= \frac{5x-5}{x^2-25} \\ \frac{2(x+5)}{(x-5)(x+5)} + \frac{1(x-5)}{(x-5)(x+5)} &= \frac{5x-5}{(x-5)(x+5)} \\ 2x+10+x-5 &= 5x-5 \\ -2x &= -10 \\ x &= 5.\end{aligned}$$

However, $x = 5$ fails upon substitution into the original equation (it results in division by zero) so this equation has no solutions.

- (b) This time we have

$$\begin{aligned}\frac{2}{x-5} + \frac{1}{x+5} &= \frac{5x-1}{x^2-25} \\ \frac{2(x+5)}{(x-5)(x+5)} + \frac{1(x-5)}{(x-5)(x+5)} &= \frac{5x-1}{(x-5)(x+5)} \\ 2x+10+x-5 &= 5x-1 \\ -2x &= -6 \\ x &= 3.\end{aligned}$$

This value of x works upon substitution into the original equation, and so $x = 3$ is the only solution.

(c) We have

$$\begin{aligned}\frac{1}{x} + \frac{1}{x-6} &= -\frac{2}{x^2} \\ \frac{x(x-6)}{x^2(x-6)} + \frac{x^2}{x^2(x-6)} &= -\frac{2(x-6)}{x^2(x-6)} \\ x^2 - 6x + x^2 &= -2x + 12 \\ 2x^2 - 4x - 12 &= 0 \\ x^2 - 2x - 6 &= 0.\end{aligned}$$

Since this trinomial is irreducible, we use the quadratic formula and see that

$$x = \frac{2 \pm \sqrt{2^2 - 4(1)(-6)}}{2(1)} = \frac{2 \pm \sqrt{28}}{2} = \frac{2 \pm 2\sqrt{7}}{2} = 1 \pm \sqrt{7}.$$

Thus the equation has two solutions: $x = 1 + \sqrt{7}$ and $x = 1 - \sqrt{7}$.

3. (a) We isolate the radical to get

$$\begin{aligned}\sqrt{4x-1} + 4x &= 3 \\ \sqrt{4x-1} &= 3 - 4x \\ 4x - 1 &= (3 - 4x)^2 \\ 4x - 1 &= 9 - 24x + 16x^2 \\ 16x^2 - 28x + 10 &= 0 \\ 8x^2 - 14x + 5 &= 0 \\ (4x - 5)(2x - 1) &= 0\end{aligned}$$

so the two possible solutions are $x = \frac{5}{4}$ and $x = \frac{1}{2}$. However, substitution of $x = \frac{5}{4}$ into the original equation gives

$$\sqrt{4x-1} + 4x = 7 \neq 3$$

so only $x = \frac{1}{2}$ is a solution.

(b) We cube both sides of the equation to obtain

$$\begin{aligned}\left(\sqrt[3]{5x^2 + 18x + 8}\right)^3 &= (x+2)^3 \\ 5x^2 + 18x + 8 &= (x+2)(x^2 + 4x + 4) \\ 5x^2 + 18x + 8 &= x^3 + 6x^2 + 12x + 8 \\ x^3 + x^2 - 6x &= 0 \\ x(x^2 + x - 6) &= 0 \\ x(x+3)(x-2) &= 0.\end{aligned}$$

The possible solutions are therefore $x = 0$, $x = -3$ and $x = 2$. When $x = 0$, we have

$$\sqrt[3]{5x^2 + 18x + 8} = \sqrt[3]{8} = 2 \quad \text{and} \quad (x + 2)^3 = 2^3 = 8,$$

so this is a solution. When $x = -3$, we have

$$\sqrt[3]{5x^2 + 18x + 8} = \sqrt[3]{45 - 54 + 8} = \sqrt[3]{-1} = -1 \quad \text{and} \quad (x + 2)^3 = (-1)^3 = -1,$$

so this is also a solution. When $x = 2$, we have

$$\sqrt[3]{5x^2 + 18x + 8} = \sqrt[3]{20 + 36 + 8} = \sqrt[3]{64} = 4 \quad \text{and} \quad (x + 2)^3 = 4^3 = 64,$$

so this is a solution too. Thus the solutions are $x = 0$, $x = -3$ and $x = 2$.

- (c) We have two radicals which must both be removed from the equation, so we start by squaring both sides to get

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

Now we can square both sides again to get

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

When $x = 2$, the lefthand side of the equation becomes $\sqrt{1} - 1 = 0$ while the righthand side is $\sqrt{4} = 2$, so this is not a solution. When $x = -1$, the lefthand side is $\sqrt{4} - 1 = 1$ and the righthand side is $\sqrt{1} = 1$ so $x = -1$ is the only solution.