

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SAMPLE TEST 1

Math 1090

FALL 2026

SOLUTIONS

[2] 1. (a) $(-\infty, -3] \cup [0, 4)$

[2] (b) We can write each of the denominators as

$$(x+1)^2 = (x+1)(x+1)$$

$$3(x+1) = 3 \cdot (x+1)$$

$$6x^2 = 2 \cdot 3 \cdot x \cdot x.$$

So we need one factor of 2, one factor of 3, two factors of x and two factors of $(x+1)$, making the lowest common denominator

$$2 \cdot 3 \cdot x^2 \cdot (x+1)^2 = 6x^2(x+1)^2.$$

[2] (c) $(-32)^{\frac{3}{5}} = (\sqrt[5]{-32})^3 = (-2)^3 = -8$

[2] (d) $\frac{|-3| - |7|}{|2 - 4|} = \frac{3 - 7}{|-2|} = \frac{-4}{2} = -2$

[2] (e) We use the grouping method:

$$3x^2 + 2x^2 - 12x - 8 = x^2(3x + 2) - 4(3x + 2)$$

$$= (3x + 2)(x^2 - 4)$$

$$= (3x + 2)(x - 2)(x + 2),$$

where we note that $x^2 - 4$ can be factored because it is a difference of squares.

[3] 2. (a) We have

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

$$= \frac{12x^5y^6}{x^2y^2}$$

$$= 12x^3y^4.$$

[3] (b) Note that

$$\sqrt[3]{54x^5} = \sqrt[3]{27x^3} \cdot \sqrt[3]{2x^2} = 3x\sqrt[3]{2x^2}$$

and

$$\sqrt[3]{16x^8} = \sqrt[3]{8x^6} \cdot \sqrt[3]{2x^2} = 2x^2\sqrt[3]{2x^2}.$$

Now we see that

$$\begin{aligned} 3x\sqrt[3]{54x^5} + 4\sqrt[3]{16x^8} &= 3x \left(3x\sqrt[3]{2x^2} \right) + 4 \left(2x^2\sqrt[3]{2x^2} \right) \\ &= 9x^2\sqrt[3]{2x^2} + 8x^2\sqrt[3]{2x^2} \\ &= 17x^2\sqrt[3]{2x^2}. \end{aligned}$$

[3] (c) We need to rationalise the denominator by multiplying by its conjugate, $2 + \sqrt{x+4}$. Thus we have

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

[4] (d) We have

$$\begin{aligned} \frac{3}{8x^2 + 6x - 9} - \frac{4}{16x^2 - 9} &= \frac{3}{(4x-3)(2x+3)} - \frac{4}{(4x-3)(4x+3)} \\ &= \frac{3(4x+3)}{(4x-3)(4x+3)(2x+3)} - \frac{4(2x+3)}{(4x-3)(4x+3)(2x+3)} \\ &= \frac{(12x+9) - (8x+12)}{(4x-3)(4x+3)(2x+3)} \\ &= \frac{12x+9-8x-12}{(4x-3)(4x+3)(2x+3)} \\ &= \frac{4x-3}{(4x-3)(4x+3)(2x+3)} \\ &= \frac{1}{(4x+3)(2x+3)}. \end{aligned}$$

- [5] 3. (a) Setting both sides to the lowest common denominator, we obtain

$$\begin{aligned}\frac{2}{x^2 + 6} &= \frac{1}{x^2 - 5} \\ \frac{2(x^2 - 5)}{(x^2 + 6)(x^2 - 5)} &= \frac{x^2 + 6}{(x^2 + 6)(x^2 - 5)} \\ 2(x^2 - 5) &= x^2 + 6 \\ 2x^2 - 10 &= x^2 + 6 \\ x^2 &= 16 \\ x &= \pm\sqrt{16} = \pm 4.\end{aligned}$$

Both of these solutions work upon substituting them back into the original equation, so we have two solutions: $x = 4$ and $x = -4$.

- [6] (b) We isolate the square root and then square both sides:

$$\begin{aligned}x + 3 + \sqrt{9 - x} &= 0 \\ \sqrt{9 - x} &= -x - 3 \\ 9 - x &= (-x - 3)^2 \\ &= x^2 + 6x + 9 \\ 0 &= x^2 + 7x \\ 0 &= x(x + 7)\end{aligned}$$

so either $x = 0$ or $x = -7$. However, substitution of $x = 0$ into the lefthand side of the original equation gives us

$$x + 3 + \sqrt{9 - x} = 0 + 3 + \sqrt{9 - 0} = 6,$$

which is not equal to the righthand side of 0. Hence this is not a solution; the only solution is $x = -7$.

- [6] (c) There are two possibilities. First, we could have

$$\begin{aligned}2x - 5 &= 3 - 5x \\ 7x &= 8 \\ x &= \frac{8}{7}.\end{aligned}$$

However, substitution of $x = \frac{8}{7}$ into the original equation gives

$$\left| 2\left(\frac{8}{7}\right) - 5 \right| = \left| -\frac{19}{7} \right| = \frac{19}{7}$$

on the lefthand side, and

$$3 - 5\left(\frac{8}{7}\right) = -\frac{19}{7}$$

on the righthand side. Consequently this is not a solution.
On the other hand, we could have

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

This works upon substitution into the original equation, so $x = -\frac{2}{3}$ is the only solution.