

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 1

MATHEMATICS 1090

FALL 2026

SOLUTIONS

[1] 1. (a) The natural numbers in the set are $\{3, 159\}$.

[1] (b) Observing that $-\frac{12}{4} = -3$, the integers in the set are $\left\{-7, 3, -\frac{12}{4}, 159\right\}$.

[1] (c) The rational numbers in the set are

$$\left\{-7, \frac{2}{9}, 3, -\frac{17}{13}, -0.\overline{23}, -5.4, -\frac{12}{4}, 0.3\overline{5}, 159, \frac{3}{6}\right\}.$$

Note that although we can rewrite $\frac{3}{6} = \frac{1}{2}$, it is still a rational number.

[1] (d) The irrational numbers in the set are $\{\pi^3, \sqrt{8}\}$.

[4] 2. We have

$$\begin{aligned}\frac{x^2y^{-4}}{(2x^{-2}y)^{-3}} &= \frac{x^2y^{-4}}{2^{-3}x^6y^{-3}} \\ &= \frac{8x^2y^3}{x^6y^4} \\ &= \frac{8}{x^4y}.\end{aligned}$$

[4] 3. We have

$$\begin{aligned}&4x(x-3) - (x-4)^2 + (3x-1)(x+5) \\ &= (4x^2 - 12x) - (x^2 - 4x - 4x + 16) + (3x^2 + 15x - x - 5) \\ &= (4x^2 - 12x) - (x^2 - 8x + 16) + (3x^2 + 14x - 5) \\ &= 4x^2 - 12x - x^2 + 8x - 16 + 3x^2 + 14x - 5 \\ &= 6x^2 + 10x - 21.\end{aligned}$$

[2] 4. (a) This is a sum of cubes:

$$64x^3 + 1 = (4x)^3 + 1^3 = (4x+1)((4x)^2 - (4x)(1) + 1^2) = (4x+1)(16x^2 - 4x + 1).$$

- [2] (b) First observe that

$$12x^2 + 21x + 9 = 3(4x^2 + 7x + 3).$$

If this can be factored, it can be in the form $(kx + p)(\ell x + q)$ where $p \cdot q = 3$ and $k \cdot \ell = 4$ for positive integers k, ℓ . This leads us to

$$12x^2 + 21x + 9 = 3(4x + 3)(x + 1).$$

- [4] (c) This can be factored using our trinomial strategies, simply replacing x with x^2 . Thus we want to factor it in the form $(x + p)(x + q)$ where $p \cdot q = -27$ and $p + q = -6$. This leads us to

$$x^4 - 6x^2 - 27 = (x^2 - 9)(x^2 + 3).$$

Now we've obtained a difference of squares, so we can further factor to obtain

$$x^4 - 6x^2 - 27 = (x - 3)(x + 3)(x^2 + 3).$$