Question 1

Let

$A =$ The set of the first 8 even numbers

$B =$ The set of the first 8 multiples of 3

Tasks:

1. Write A and B in Roster Method.
2. Verify that $A \cap B = B \cap A$.

Solution:

1. **Roster Method:**
   - The first 8 even numbers: $A = \{2, 4, 6, 8, 10, 12, 14, 16\}$
   - The first 8 multiples of 3: $B = \{3, 6, 9, 12, 15, 18, 21, 24\}$
2. **Intersection Verification:**
   - $A \cap B = \{6, 12\}$
   - $B \cap A = \{6, 12\}$

   Since $A \cap B = B \cap A$, this is verified.

Question 2

Given: $z = 3 - 7i$.

Find $|\overline{z}|$, where $\overline{z}$ is the complex conjugate of z.

Solution:

1. The complex conjugate of $z = 3 - 7i$ is $\overline{z} = 3 + 7i$.
2. The modulus $|\overline{z}|$ is given by $|\overline{z}| = \sqrt{(3)^2 + (7)^2}$.
3. Calculating:

$$|\overline{z}| = \sqrt{9 + 49} = \sqrt{58}$$

Question 3

Given Functions:

$f(x) = 5x + 1$

$g(x) = x^2$

Find:

1. $(f \circ g)(x)$
2. $(g \circ f)(x)$

Solution:

1. $(f \circ g)(x) = f(g(x))$

$$f(g(x)) = f(x^2) = 5x^2 + 1$$

2. $(g \circ f)(x) = g(f(x))$

$$g(f(x)) = g(5x + 1) = (5x + 1)^2 = 25x^2 + 10x + 1$$

Question 4

Solve the quadratic equation $2x^2 - 4x + 1 = 0$.

Solution: The quadratic formula is:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For $2x^2 - 4x + 1 = 0$, $a = 2$, $b = -4$, and $c = 1$.

1. Calculate the discriminant:

$$b^2 - 4ac = (-4)^2 - 4 \cdot 2 \cdot 1 = 16 - 8 = 8$$

2. Substitute into the formula:

$$x = \frac{-(-4) \pm \sqrt{8}}{2 \cdot 2} = \frac{4 \pm \sqrt{8}}{4} = \frac{4 \pm 2\sqrt{2}}{4} = 1 \pm \frac{\sqrt{2}}{2}$$

So, the solutions are:

$$x = 1 + \frac{\sqrt{2}}{2} \quad \text{and} \quad x = 1 - \frac{\sqrt{2}}{2}$$