1. Describe the following sets in set notation:
   (a) The set containing the numbers 0, 1, and 3

   Solution: $\{0, 1, 3\}$

   (b) The set of all real numbers greater than 4

   Solution: $\{x \mid x > 4\}$

2. If A and B are the sets $A = \{0, 1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$, then write the following in set notation:
   (a) $A \cap B$

   Solution: $A \cap B = \{3, 4\}$

   (b) $A \cup B$

   Solution: $A \cup B = \{0, 1, 2, 3, 4, 5, 6\}$

3. Evaluate the following expressions, keeping in mind the order of operations:
   (a) $1 + 2 \cdot 3 + 4$

   Solution: $1 + 2 \cdot 3 + 4 = 1 + (2 \cdot 3) + 4 = 1 + 6 + 4 = \mathbf{11}$

   (b) $(1 + 2) \cdot 3 + 4$

   Solution: $(1 + 2) \cdot 3 + 4 = 3 \cdot 3 + 4 = (3 \cdot 3) + 4 = 9 + 4 = \mathbf{13}$

   (c) $1 + 2 \cdot (3 + 4)$

   Solution: $1 + 2 \cdot (3 + 4) = 1 + 2 \cdot 7 = 1 + (2 \cdot 7) = 1 + 14 = \mathbf{15}$

   (d) $(1 + 2) \cdot (3 + 4)$

   Solution: $(1 + 2) \cdot (3 + 4) = 3 \cdot 7 = \mathbf{21}$

   (e) $2(3 + 4)^2 - 8$

   Solution: $2(3 + 4)^2 - 8 = 2(7)^2 - 8 = 2 \cdot 49 - 8 = 98 - 8 = 90$

4. Evaluate the following expressions involving fractions:
   (a) $\frac{3}{8} + \frac{1}{7}$

   Solution: $\frac{7\cdot 3}{56} + \frac{8}{56} = \frac{29}{56}$

   (b) $\frac{2x+3}{x-5} + \frac{x-1}{2(x-5)}$

   Solution: $\frac{2(2x-3)}{2(x-5)} + \frac{x-1}{2(x-5)} = \frac{5x-7}{2(x-5)}$

5. The following intervals are written in set notation. Write them in interval notation.
   (a) $\{x \mid 0 \leq x \leq 1\}$

   Solution: $[0, 1]$

   (b) $\{x \mid 0 < x < 1\}$

   Solution: $(0, 1)$

   (c) $\{x \mid 0 < x \leq 1\}$

   Solution: $(0, 1]$

   (d) $\{x \mid x > 5\}$

   Solution: $(5, \infty)$

   (e) $\{x \mid x \leq 3\}$

   Solution: $(-\infty, 3]$

   (f) $\{x \mid 2 \leq x < 3 \text{ or } x > 11\}$

   Solution: $[2, 3) \cup (11, \infty)$

6. Consider the intervals $I = [0, 1]$ and $J = \left(\frac{1}{2}, \frac{3}{2}\right)$. Evaluation the following:
   (a) $I \cap J$

   Solution: $\left(\frac{1}{2}, 1\right]$

   (b) $I \cup J$

Solution: $\left[0, \frac{3}{2}\right)$

7. Evaluate the following expressions involving exponents:

(a) $x^2 \cdot x^5$

Solution: x^7

(b) $\frac{x^5}{x^2}$

Solution: x^3

(c) $(x^2)^5$

Solution: x^{10}

(d) $(x+y)^2$

Solution: $x^2 + 2xy + y^2$

(e) 5^{-1}

Solution: $\frac{1}{5}$

(f) 2^{-3}

Solution: $\frac{1}{2^3} = \frac{1}{8}$

(g) $8^{\frac{4}{3}}$

Solution: $\left(\sqrt[3]{8}\right)^4 = (2)^4 = 16$

8. Factor the following polynomials:

(a) $x^2 + 5x + 6$

Solution: $(x+2)(x+3)$

(b) $2x^2 - 5x - 3$

Solution: $(2x+1)(x-3)$

(c) $x^2 - 4$

Solution: $(x+2)(x-2)$

9. Multiply the following polynomials:

   (a) $(x+1)(x-8)$

   Solution: $x^2 - 7x - 8$

   (b) $(3x-4)(x-5)$

   Solution: $3x^2 - 19x + 20$

   (c) $(x-2)(x^2+3x+7)$

   Solution: $x^3 + x^2 + x - 14$