Week-in-Review 9, (Chapter 5.1, 5.2)

Problem 1. Sketch the following using a number line and then express the set of real numbers using interval notation.

(1) \{x \mid x \geq 5, \text{ and } x \neq 10\}

(2) \{x \mid x \leq 5, \text{ and } x \neq \pm 2\}

(3) \{x \mid x \leq -3, \text{ or } x \geq 5\}

(4) \{x \mid x \leq -3, \text{ and } x \geq 5\}
Problem 2. Are the following functions?

(1) \( y = 5 \).

(2) \( E = \{(0, 0), (5, 1), (-2, 3), (0, 5), (6, 7)\} \)
Problem 3. Are the following functions polynomials? If not, why not? If yes, what is the degree of the polynomial, what is it’s leading coefficient and what what is the constant term? Is it an even or odd polynomial?

(1) \( f(x) = x^5 - 6x^6 + 5^3 \)

(2) \( g(x) = x^3 + \sqrt{x^3} - 10 \)

(3) \( h(x) = \frac{1}{2}(x - 2)(6x^2 - 5) \)
Problem 4. Given the polynomial $f(x) = x^2 - 5x + 6$, find the following.

(1) $f(0)$

(2) $f(-3)$

(3) $f(2 + a)$

(4) $f(x + h) - f(x)$
Problem 5.

Below is the graph of a function $f(x)$. Determine the following.

(a) $f(-6)$

(b) $f(-2)$

(c) $f(0)$

(d) $f(3)$

(e) $f(8)$
Problem 6. Determine the end behaviour of the following polynomials. What is their domain? What is their $y$–intercept?

(1) $f(x) = x^4 + 3x^2 - 5x^9$

(2) $g(x) = \frac{1}{2}(x - 2)(6x^2 - 5)$

(3) $h(x) = 2x^2 - 4x^4 + 6x^6 - 8x^8$
Problem 7. Find the real zeros of the following polynomials, if they exist.

1. \( f(x) = x(x - 1)(x - 2)(x + 3)^2 \)

2. \( g(x) = x^2 - x - 3 \)

3. \( h(x) = 5x^2 - 2x - 9 \)

4. \( k(x) = x^2 - 3x + 4 \)
Problem 8. Given the polynomial \( f(x) = 3x^2 - 5x + 1 \), find the following.

1. Domain

2. Vertex

3. The axis of symmetry

4. Maximum value

5. Minimum value

6. Range
Problem 9. The linear price demand equation for waffle makers is given by \( p = -20x + 20010 \), where \( x \) is the number of units sold. If the fixed cost for the company is $12000 and if it costs $10 to make each unit, find the following.

1. The Revenue function \( R(x) \).

2. The number of units that must be sold to maximize Revenue.

3. The maximum Revenue.

4. The price per unit at maximum Revenue.
(5) The Cost function $C(x)$. 

(6) The Profit function $P(x)$. 

(7) The number of units that must be sold to maximize Profit. 

(8) The maximum Profit. 

(9) The price per unit at maximum Profit. 

(10) The number of units that must be sold to break even.