Inequalities and Absolute Values – Problems

1. Solve the following inequalities, sketch their solution on the number line and express the answer in interval notation.

(a) $x^2 + 3x > 4x + 6$

(b) $2x + 5 \leq 4x - 7$

(c) $1 \leq 3x + 5 < 4$

(d) $3 < |3x + 9| < 6$

(e) $x - 3 \leq \dfrac{10}{x}$

2. Solve the following inequalities, and express the answer in interval notation.

(a) $1 < |5 - x| < 8$

(b) $4 \leq \dfrac{4}{3 - x} < 6$

(c) $9 - x^2 < 0$

(d) $|9 - x^2| < 1$

(e) $(x - 2)(5 - x)(4x - 3) \geq 0$

(f) $\dfrac{5 - x}{8 - 2x} \leq 0$

3. Solve the following inequalities, and sketch the corresponding solutions.

(a) $3x + y \leq 5$

(b) $2x + 4y > 12$

(c) $4x - 2y < 18$

(d) $2y - 3x < -14$

(e) $|x - y| < 1$

4. Express all points x strictly within 5 units of 3, excluding 3. Sketch the set, express it in terms of intervals, and as inequalities.

5. Determine which of the points $(1, 3), (2, 5), (10, -14)$ lie in the region corresponding to the inequality $3x - 2y \leq -5$.