THEORETICAL PART:

Definition:

A linear inequality in the two variables x and y is an inequality that can be written in the form:

$$ax + by < c, \quad ax + by > c, \quad ax + by \le c, \quad ax + by \ge c,$$

where a, b, c are constants and a and b are not both 0.

Procedure (Solving linear inequalities in two variables):

- Graph the line that results from replacing the inequality symbol with =.
- Make the line solid if the inequality sign is $\le$ or $\ge$ and dashed if the symbol is $<$ or $>$. A solid line indicates that points on the line are included in the solution set while a dashed line indicates that points on the line are excluded from the solution set.
- Determine which of the half-planes defined by the boundary line solves the inequality by substituting a **test point** from one of the two half-planes into the inequality. If the resulting numerical statement is true, all the points in the same half-plane as the test point solve the inequality. Otherwise, the points in the other half-plane solve the inequality. Shade in the half-plane that solves the inequality.

Definition: Absolute value inequality meaning:

$$|x| < a \equiv x < a \quad \text{and} \quad x > -a$$

$$|x| > a \equiv x > a \quad \text{or} \quad x < -a$$

PRACTICAL PART:

1. Solve the following linear inequalities by graphing their solution sets:

   (a) $3x + 2y < 12$

   (b) $x - y \le 0$

2. Graph the solution sets that satisfy the following inequalities:
   - $5x - 2y < 10$ and $y \leq x$.
   - $x + y < 4$ or $x \geq 4$.

3. Graph the solution set in $\mathbb{R}^2$ that satisfies the joint conditions $|x - 3| > 1$ and $|y - 2| \leq 3$.