

# Algebra Study Guide

This study guide covers fundamental algebra concepts, formulas, and practice problems.

## Basic Formulas

- Linear Equation:  $y = mx + b$
- Slope Formula:  $m = (y_2 - y_1) / (x_2 - x_1)$
- Quadratic Formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Distance Formula:  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- Midpoint Formula:  $M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$

## Worked Examples

Example 1: Solve for x in  $2x + 5 = 13$

Solution:  $2x = 13 - 5 = 8$ , therefore  $x = 4$

Example 2: Factor  $x^2 + 5x + 6$

Solution:  $(x + 2)(x + 3) = x^2 + 5x + 6$

## Practice Problems

1. Solve:  $3x - 7 = 14$
2. Simplify:  $2x + 3x - 5x$
3. Solve:  $x^2 - 9 = 0$
4. Find the slope: (2, 3) and (5, 9)
5. Solve the system:  $x + y = 5$ ,  $2x - y = 1$

Answer Key: 1)  $x = 7$ , 2) 0, 3)  $x = 3$  or  $-3$ , 4)  $m = 2$ , 5)  $x = 2$ ,  $y = 3$