

Algebraic Inequalities

Tutoring Centre Ferndale



Introduction

Algebraic inequalities are statements that compare two expressions using inequality symbols. They are used to show the relationship between quantities that are not necessarily equal.

Inequality Symbols

- $<$: less than
- \leq : less than or equal to
- $>$: greater than
- \geq : greater than or equal to

Rules for Solving Inequalities

- **Addition/Subtraction Rule:** You can add or subtract the same number from both sides of an inequality without changing its direction.
- **Multiplication/Division Rule:** You can multiply or divide both sides of an inequality by the same positive number without changing its direction. If you multiply or divide by a negative number, you must reverse the direction of the inequality.

Examples

Example 1

Solve $x + 3 < 7$.

- Subtract 3 from both sides: $x < 4$.

Example 2

Solve $2x \geq 10$.

- Divide both sides by 2: $x \geq 5$.

Example 3

Solve $-3x < 9$.

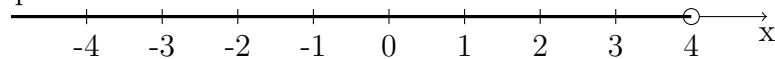
- Divide both sides by -3 and reverse the inequality: $x > -3$.

Graphing Inequalities

Graphing inequalities on a number line helps to visualize the solution set.

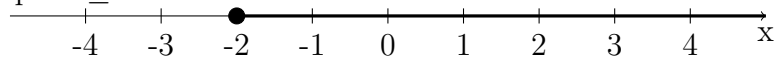
Example 4

Graph $x < 4$.



Example 5

Graph $x \geq -2$.

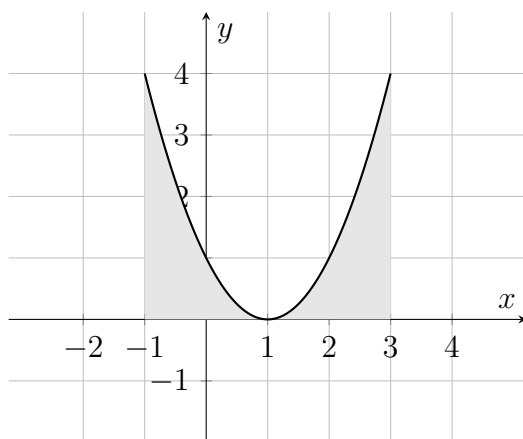


Example 6: Quadratic Inequality

Solve and graph the inequality $y < x^2 - 2x + 1$.

- This inequality represents the region below the parabola defined by the equation $y = x^2 - 2x + 1$.

Graph:



Exercises

Exercise 1

Solve and graph the inequality $x - 5 \leq 2$.

Exercise 2

Solve and graph the inequality $4x > 12$.

Exercise 3

Solve and graph the inequality $-2x \geq 6$.

Exercise 4

Graph the inequality $y \leq 2x + 1$.

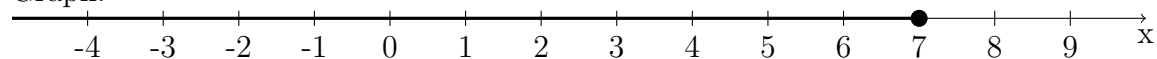
Answers

Answer 1

Solve $x - 5 \leq 2$.

- Add 5 to both sides: $x \leq 7$.

Graph:

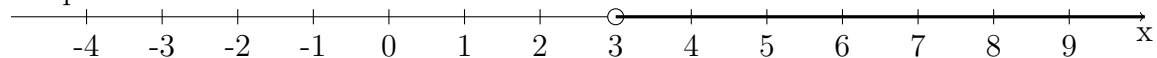


Answer 2

Solve $4x > 12$.

- Divide both sides by 4: $x > 3$.

Graph:

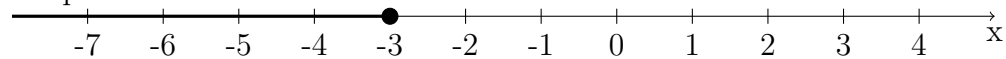


Answer 3

Solve $-2x \geq 6$.

- Divide both sides by -2 and reverse the inequality: $x \leq -3$.

Graph:



Answer 4

Graph: $y \leq 2x + 1$

