

## Solving Inequalities

$$2x + 4 \leq 10$$

$x$	$2x + 4 \leq 10$	
1	$6 \leq 10$	✓
2	$8 \leq 10$	✓
3	$10 \leq 10$	✓
4	$12 \leq 10$	×
5	$14 \leq 10$	×

Equation:  $2x + 4 = 10$ , solution:  $x = 3$



Inequality:  $2x + 4 \leq 10$ , solution:  $x \leq 3$



### Rules for inequalities

- $A \leq B \Leftrightarrow A + C \leq B + C$
- $A \leq B \Leftrightarrow A - C \leq B - C$
- If  $C > 0$ , then  $A \leq B \Leftrightarrow CA \leq CB$
- If  $C < 0$ , then  $A \leq B \Leftrightarrow CA \geq CB$
- If  $A > 0$  and  $B > 0$ , then  $A \leq B \Leftrightarrow \frac{1}{A} \geq \frac{1}{B}$
- If  $A \leq B$  and  $C \leq D$ , then  $A + C \leq B + D$

**Example 1:** Solve inequality and sketch the solution set.

$$3x - 1 \geq 3 + x$$



**Example 2:** Solve the inequality.

$$5 \leq 3x - 4 \leq 14$$

### Solving Nonlinear Inequalities

#### The sign of a product or quotient

- Even number of negative terms = positive.
- Odd number of negative terms = negative.

#### Guidelines for Solving Nonlinear Inequalities

1. Move All Terms to One Side.
2. Find the Intervals. (    ) (    )
3. Make a Table or Diagram.
4. Solve.

**Example 3:** Solve the nonlinear inequality

$$x^2 \leq x + 2$$



**Example 4:** Solve the nonlinear inequality

$$(x - 2)^2(x - 3)(x + 1) \leq 0$$

**Example 5:** Solve the nonlinear inequality

$$\frac{3 + x}{3 - x} \geq 1$$

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## Absolute Value Equations and Inequalities

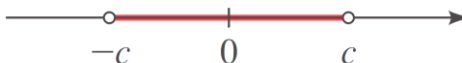
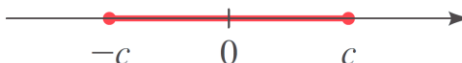
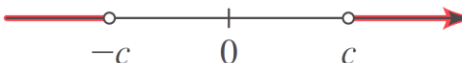
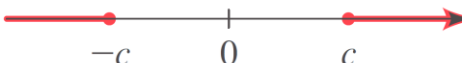
### Absolute Value Equations

$$|u| = a \quad \text{means} \quad u = a \text{ or } u = -a$$

**Remember:** Solve the absolute value equation

$$|1 - 2z| + 6 = 9$$

### Properties of Absolute Value Inequalities

inequality	Equivalent form	Graph
• $ x  < c$	$-c < x < c$	
• $ x  \leq c$	$-c \leq x \leq c$	
• $ x  > c$	$x < -c \text{ or } c < x$	
• $ x  \geq c$	$x \leq -c \text{ or } c \leq x$	

**Example 1:** Solve the absolute value inequality

$$|x - 2| + 2 < 3$$

**Example 2:** Solve the inequality

$$|x + 1| \geq 1$$



**Example 3:** Solve the absolute value inequality. Express the answer using interval notation and graph the solution set.

- $3 - |2x + 4| \leq 1$

- $\left| \frac{2x-3}{2} + \frac{1}{3} \right| > 1$

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