

# REVIEW OF PRE-CALCULUS

## LESSON 1: INTRODUCTION TO CALCULUS AND INEQUALITIES

Objectives: 1. To preview calculus as the mathematics of motion and change  
2. To define absolute value both algebraically and geometrically  
3. To solve inequalities

### The Real Number System

#### Algebra of Inequalities

##### Interval Notation

$$(a,b) = \{ x : a < x < b \}$$

$$[a,b] = \{ x : a \leq x \leq b \}$$

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$$(-\infty, b) = \{ x : x < b \}$$

$$[a, +\infty) = \{ x : x \geq a \}$$

#### Properties of Inequalities

##### Absolute Value Inequality

If  $|a| < |b|$ , then  $a^2 < b^2$

##### Triangle Inequality

$$|a + b| \leq |a| + |b|$$

##### Absolute Value

$$|a| = \begin{cases} a & \text{if } a \geq 0 \\ -a & \text{if } a < 0 \end{cases} \quad |a| = \sqrt{a^2}$$

#### Examples

1.  $|x - 2| < 4$

2.  $|3x - 4| \leq 6$

3.  $\frac{x-2}{x-4} > \frac{x-3}{x}$

4.  $x^2 - 2x - 3 > 0$

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

## Problems

1.  $\frac{x}{2} + \frac{x}{3} > 5$

2.  $\left| \frac{x-3}{2} \right| \geq 5$

3.  $|2x+1| < 5$

4.  $x^2 + x - 1 \leq 5$

5. Prove  $|ab| = |a||b|$

6.  $\frac{x+1}{x-2} < \frac{x}{x+3}$

7.  $\frac{x^2 - 2x}{x^2 - 3} \geq 0$