7.1 Linear Inequalities in One Variable

Wednesday, June 30, 2021 9:48 AM

Pre-Calculus 11

7.1 Linear Inequalities in One Variable

An inequality tells us the relationship between two numbers or expressions.

A. Operations with Inequalities

when you multiply or divide by a negative number the inequality changes direction

Original Inequality	Operation	Resulting Inequality	
$9 > 6$	**Add** 3	$9+3 \blacksquare 6+3$	$12 > 9$
$9 > 6$	**Subtract** 3	$9-3 \blacksquare 6-3$	$6 > 3$
$9 > 6$	**Multiply** by 3	$9\times 3 \blacksquare 6\times 3$	$27 > 18$
$9 > 6$	**Multiply** by -3	$9\times -3 \blacksquare 6\times -3$	$-27 < -18$
$9 > 6$	**Divide** by 3	$\frac{9}{3} \blacksquare \frac{6}{3}$	$3 > 2$
$9 > 6$	**Divide** by -3	$\frac{9}{-3} \blacksquare \frac{6}{-3}$	$-3 < -2$

Similar results are observed for inequalities that include the symbols $<, \leq$ and $\geq$.

B. Solving an Inequality

To solve an inequality means to find the values of the variable that make the inequality true.

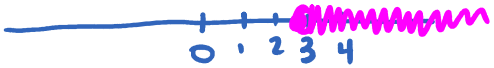
Example 1: Solve each inequality and graph its solution. Express your answer in set notation.

a) $3x - 4 \geq 5$

$+4 \quad +4$

$\frac{3x}{3} \geq \frac{9}{3}$

$x \geq 3$



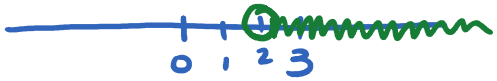
$\{x \mid x \geq 3 \quad x \in \mathbb{R}\}$

b) $4x - 1 > x + 5$

$4x > x + 6$

$3x > 6$

$x > 2$



$\{x \mid x > 2 \quad x \in \mathbb{R}\}$

Example 2: Solve the following inequalities algebraically. Express your final answer in interval notation.

a) $6x - 3(x + 1) > x + 5$

$6x-3x-3>x+5$

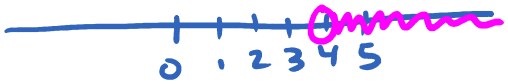
$3x-3>x+5$

$2x-3>5$

$2x>8$

$x>4$

$\{x \mid x>4 \ x \in \mathbb{R}\}$



$(4, \infty)$

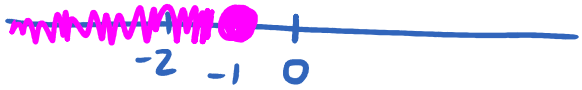
b) $2(3 - x) - 1 \geq 7.$

$6-2x-1 \geq 7$

$-2x+5 \geq 7$

$-2x \geq 2$

$x \leq -1$



$(-\infty, -1]$

Example 3: Solve the following inequalities algebraically. Answer in both set notation and interval notation.

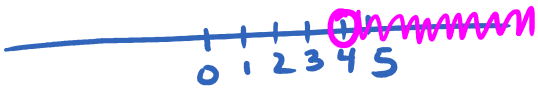
a) $\frac{3x}{4} + \frac{x}{2} > 5$

$4\left(\frac{3x}{4}\right) + 4\left(\frac{x}{2}\right) > 4(5)$

$3x + 2x > 20$

$5x > 20$

$x > 4$



set $\{x \mid x>4 \ x \in \mathbb{R}\}$

interval $(4, \infty)$

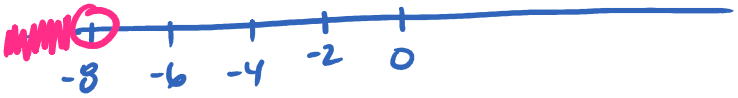
b) $\frac{3+x}{2} < \frac{x-2}{4}$

$4\left(\frac{3+x}{2}\right) < 4\left(\frac{x-2}{4}\right)$

$6 + 2x < x - 2$

$6 + x < -2$

$x < -8$



$\{x \mid x<-8 \ x \in \mathbb{R}\}$

$(-\infty, -8)$