

U2D8_T Solving Inequalities MCR 3UI

Monday, February 25, 2019 9:50 AM



U2D8_T
Solving In...

U2D8 MCR3UI Inequalities

Warm Up Solve the following:

a) $3x^2 - 5x + 2 = 0$

$$(3x-2)(x-1) = 0$$

$$x = \frac{2}{3} \text{ OR } x = 1$$

b) $x^2 - 6x - 8 = 0$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(-8)}}{2}$$

$$x = \frac{6 \pm \sqrt{68}}{2}$$

$$x = \frac{6 \pm \sqrt{4 \times 17}}{2}$$

$$x = \frac{6 \pm 2\sqrt{17}}{2}$$

$$x = \frac{2(3 \pm \sqrt{17})}{2}$$

$$x = 3 \pm \sqrt{17}$$

Preamble Is $3 < 6$?

$$x-1 \quad x-1$$

~~$$-3 < -6$$~~

$$-3 > -6$$

What about -3 and -6 ?



Part A: Linear Inequalities

To solve a linear inequality, treat it like an equation but **flip** the sign if you ever **multiply** or **divide** by a **negative**.

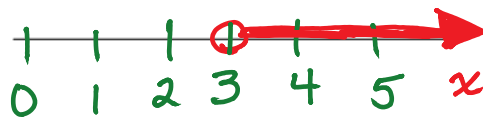
Solve the following linear inequalities and graph your answers on the number line.

$$2x - 1 > 5$$

$$2x > 6$$

$$x > 3$$

$$3 < x$$



$$-x - 5 \geq 0$$

$$-x \geq 5$$

$$x \leq -5$$

flip sign when dividing by -1.

$$\begin{array}{r} -x - 5 \geq 0 \\ +x \quad +x \end{array}$$

$$-5 \geq x$$

$$x \leq -5$$

means include -5 so plot the solid point at -5



$$2(x + 3) \leq x + 4$$

$$2x + 6 \leq x + 4$$

$$2x - x \leq 4 - 6$$

$$x \leq -2$$



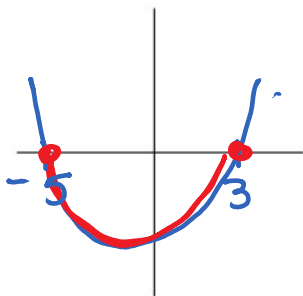
Part B: Quadratic Inequalities

To solve quadratic inequalities, determine the zeroes of the quadratic equation. Then sketch a graph using the zeroes and the direction of opening to determine for what x-values the parabola is greater than or less than zero (i.e., above or below the x-axis).

Solve the following quadratic inequalities by graphing.

a) $(x-3)(x+5) \leq 0$

∴ zeros:
 $x=3, x=-5$

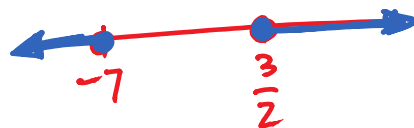
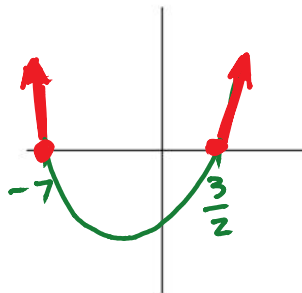


$$\therefore \left\{ -5 \leq x \leq 3 \right\}$$

b) $(2x-3)(x+7) \geq 0$

∴ zeros:
 $x = \frac{3}{2}, x = -7$

> means above x-axis



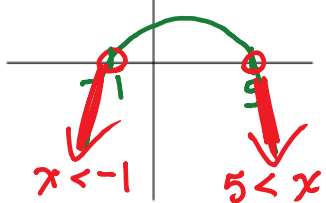
$$x \leq -7 \text{ or } \frac{3}{2} \leq x$$

$$\left\{ x \leq -7 \text{ or } x \geq \frac{3}{2} \right\}$$

c) $-3(x+1)(x-5) < 0$

∴ $x = -1, x = 5$

< below x-axis

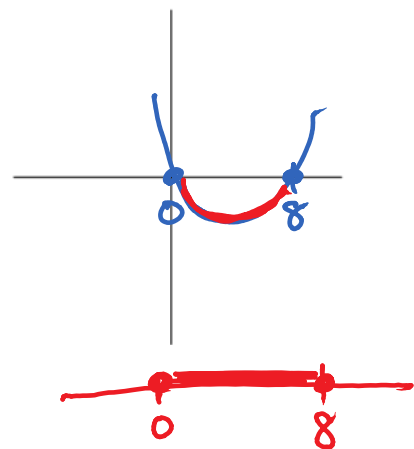


$\{x < -1 \text{ or } x > 5\}$

e) $9k(k-8) \leq 0$

zeros: $x = 0, x = 8$

∴ $\{0 \leq x \leq 8\}$



d) $5x^2 - 2x - 3 > 0$

~~$\frac{1}{5} \pm \frac{1}{3}$~~

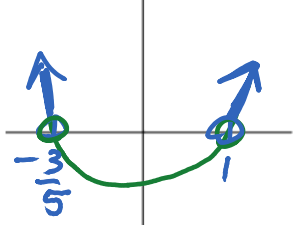
> above x-axis

$(x-1)(5x+3) > 0$

zeros: $x = 1, x = -\frac{3}{5}$

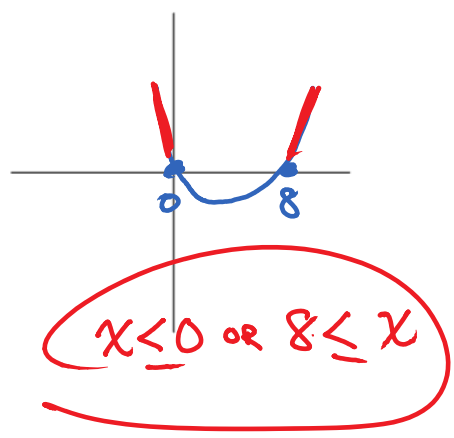
∴

$\{x < -\frac{3}{5} \text{ or } x > 1\}$



f) $9k(k-8) \geq 0$

$\{x \leq 0 \text{ or } x \geq 8\}$



Part A Linear Inequalities

1. Solve the following linear inequalities.

Question	Answer
a) $3x + 6 > -3$	$x > -3$
b) $7x \geq 2x + 10$	$x \geq 2$
c) $3(x - 5) \leq 5x - 9$	$x \geq -3$
d) $3(y - 5) \leq 9(y + 1) - 2y$	$y \geq -6$
e) $\frac{x - 2}{3} \leq 2x - 3$	$x \geq \frac{7}{5}$

Part B Quadratic Inequalities

Solve the following quadratic inequalities.

a) $x^2 - 1 > 0$	$x > 1$ or $x < -1$
b) $x^2 - x - 12 < 0$	$-3 < x < 4$
c) $(2x - 3)(x + 4) \geq 0$	$x \geq \frac{3}{2}$ or $x \leq -4$
d) $-3x(x - 5) \leq 0$	$x \leq 0$ or $x \geq 5$
e) $k^2 - 9k \geq 0$	$k \leq 0$ or $k \geq 9$

Extra Practice Questions:

1. Solve the following inequalities and graph the solution on the real number line:

a) $6 - 2x > 4$	b) $4(1 - x) \geq 3(x - 1)$
c) $2(3x - 1) - 5x > -6(1 - x) + 7$	d) $\frac{2x}{3} + 1 \geq 2$
e) $\frac{x + 1}{2} < \frac{x + 2}{3}$	f) $\frac{2 - 3x}{2} + \frac{2}{3} \leq \frac{3x - 2}{6}$

2. Solve the following inequalities and graph the solution on the real number line:

a) $4x^2 + 8x + 3 > 0$	b) $10x^2 - 17x + 3 \leq 0$
c) $2x^2 + 11x + 15 < 0$	d) $8x^2 - 10x - 12 \geq 0$
e) $-6x^2 - 15x - 9 > 0$	f) $12x^2 - 11x + 2 < 0$
g) $-4x^2 + 18x + 10 \leq 0$	

ANSWERS

1a) $x < 1$	b) $x \leq 1$	c) $x < \frac{-3}{5}$
d) $x \geq \frac{3}{2}$	e) $x < 1$	f) $x \geq 1$
2a) $\{x < -\frac{3}{2}\} \cup \{x > -\frac{1}{2}\}$	b) $\{\frac{1}{5} \leq x \leq \frac{3}{2}\}$	c) $\{-3 < x < -\frac{5}{2}\}$
d) $\{x \leq -\frac{3}{4}\} \cup \{x \geq 2\}$	e) $\{-\frac{3}{2} < x < -1\}$	f) $\{\frac{1}{4} < x < \frac{2}{3}\}$
g) $\{x \leq -\frac{1}{2}\} \cup \{x \geq 5\}$		