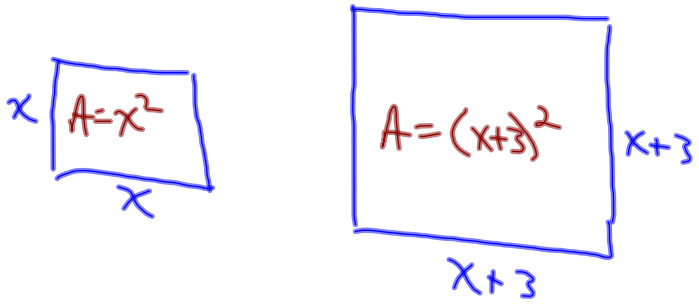
Warm Up

A fashion magazine prints its photographs in two square sizes. The larger photographs measure 3 cm longer than the smaller photographs. Three of the smaller photographs have a combined area 9.0 cm^2 more than the area of one of the larger size. Determine the dimensions of each size of photograph.



$$3x^2 = (x+3)^2 \times 9$$

$$3x^2 = x^2 + 6x + 9 + 9$$

$$\frac{2x^2}{2} - \frac{6x}{2} - \frac{18}{2} = \frac{0}{2}$$

$$x^2 - 3x - 9 = 0$$

$$x = \frac{3 \pm \sqrt{9 - 4(1)(-9)}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{45}}{2}$$

$$x = \frac{3 - \sqrt{45}}{2}$$

Inadmissible

$$x = \frac{3 + \sqrt{45}}{2}$$

$$x = 4.85 \text{ cm}$$

Smaller: 4.85 cm

Larger: 7.85 cm

Quadratic Inequalities

- Quick review of linear inequalities...

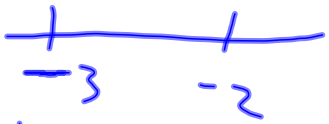
* Multiply or divide BY a negative... Reverse the inequality!!

$\frac{20}{-2} = \frac{20}{-2}$

$-10 = -10$

$\frac{20}{10} < \frac{30}{10}$

$2 < 3$



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

$20 < 30$

$-20 > -30$

$\frac{20}{-10} < \frac{30}{-10}$

$-2 > -3$

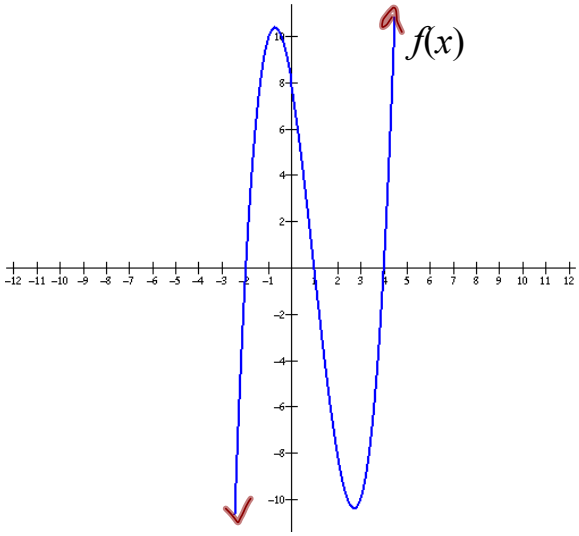
Solve the following: $2x - 5 > 6x + 7$

$2x - 6x > 7 + 5$

$\frac{-4x}{-4} > \frac{12}{-4}$

$x < -3$

- Determining solutions to an inequality from a graph....



Using the graph of $f(x)$ shown, determine each of the following:

Where is $f(x) > 0$? $(y>0)$

$-2<x<1$ OR $x>4$

Where is $f(x) \leq 0$?

$x \leq -2$ OR $1 \leq x \leq 4$

- Let's look at finding solution sets of quadratic inequalities....

Solve: $x^2 - 5x < 14$

We will look at two different approaches...

I. Using cases: (Factor)

$x^2 - 5x - 14 < 0$

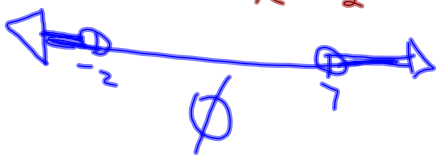
$(x-7)(x+2) < 0$ ← ① $(+)(-) =$ Negative ② OR $(-)(+) =$ Negative

Cases: > 0 → $(+)(+) = +$, $(-)(-) = +$

Case I: $(+,-)$

$x - 7 > 0$ and $x + 2 < 0$ OR

$x > 7$ $\quad x < -2$

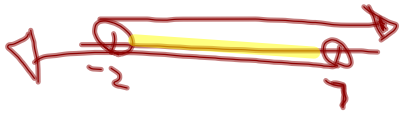


$\emptyset$

Case 2: $(-,+)$

$x - 7 < 0$ and $x + 2 > 0$

$x < 7$ $\quad x > -2$

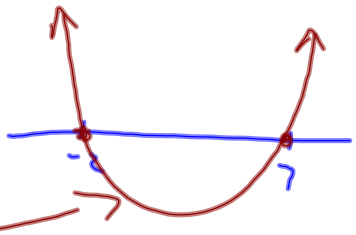


$-2 < x < 7$

II. Using a sketch:

① $x^2 - 5x - 14 < 0$

Find zero's: $x = 7, -2$



$-2 < x < 7$

Ex: $(-x^2 + x + 20 > 0)(-1)$

① $x^2 - x - 20 < 0$

$(x-5)(x+4) < 0$

$-4 < x < 5$

Example: (Use both methods!!)

Solve: $3x^2 \geq 13x - 10$

$3x^2 - 13x + 10 \geq 0$

$3x^2 - 10x - 3x + 10 \geq 0$

$x(3x-10) - 1(3x-10) \geq 0$

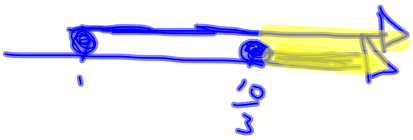
$(3x-10)(x-1) \geq 0$ (Positive)

Case 1: (+, +)

$3x - 10 \geq 0$ & $x - 1 \geq 0$

$3x \geq 10$ $\quad x \geq 1$

$x \geq \frac{10}{3}$



$x \geq \frac{10}{3}$

OR

Case 2: (−, −)

$x - 10 \leq 0$ & $x - 1 \leq 0$

$3x \leq 10$ $\quad x \leq 1$

$x \leq \frac{10}{3}$

$x \leq 1$

$\{x \mid x \leq 1$ OR $x \geq \frac{10}{3}, x \in R\}$

Graphing:

$3x^2 - 13x + 10 \geq 0$

$x = 1, \frac{10}{3}$