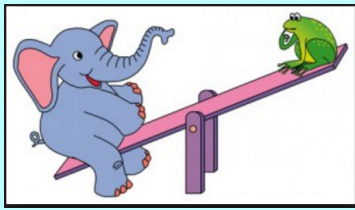Solving Quadratic Inequalities

Feb 16-11:45 PM

What are we looking to accomplish?

~ Solve Quadratic Inequalities

~ Graph Quadratic Inequalities

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Old News

We know LOTS of ways to solve quadratic equations:

~ Factoring

~ Quadratic Formula

~ Completing the Square

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Now, Let's Talk about Quadratic *Inequalities*

A **quadratic inequality in two variables** can be written in one of the following forms, where a, b, and c are real numbers and $a \neq 0$. Its solution set is a set of ordered pairs (x, y).

Solve the inequality $x^2 - 10x + 18 \leq -3$ by using algebra.

Step 1: Change the inequality to an equality.

Step 2: Solve. (Your zeros are called your critical values.)

Step 3: Test the regions around your critical values.

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3 Steps to Success

Solve the inequality by using algebra.

$x^2 - 6x + 10 \geq 2$ $-2x^2 + 3x + 7 < 2$

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Your Turn!

Solve.

a) $x^2 - 10x + 17 \geq -4$ b) $2x^2 - 7x - 2 < 2$

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Everyone's Favorite...Word Problems!

The monthly profit P of a small business that sells bicycle helmets can be modeled by the function $P(x) = -8x^2 + 600x - 4200$, where x is the average selling price of a helmet. What range of selling prices will generate a monthly profit of at least $6000?

$P(x) \geq 6000$

$-8x^2 + 600x - 4200 \geq 6000$

$-8(x^2 - 75x + 525) \geq (750)(8)$

$x^2 - 75x + 525 \geq -750$

$x^2 - 75x + 1275 = 0$

$\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, $\dfrac{-(-75) \pm \sqrt{-75^2 - 4(1)(1275)}}{2(1)}$

$\dfrac{75 \pm \sqrt{5625 - 5100}}{2} = \dfrac{75 \pm \sqrt{525}}{2}$

$\dfrac{75 \pm 22.9}{2} = \begin{array}{c} 26.09 \\ 48.96 \end{array}$

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Another One!

A business offers educational tours to Patagonia, a region of South America that includes parts of Chile and Argentina . The profit P for x number of persons is $P(x) = -25x^2 + 1250x - 5000$. The trip will be rescheduled if the profit is less $7500. How many people must have signed up if the trip is rescheduled?

$P(x) < 7500$

$-25x^2 + 1250x - 5000 < 7500$

$\dfrac{-25x^2}{-25} + \dfrac{1250x}{-25} - \dfrac{12500}{-25} = \dfrac{0}{-25}$

$x^2 - 50x + 500 = 0$

$\dfrac{-(-50) \pm \sqrt{(-50)^2 - 4(1)(500)}}{(2)(1)}$

$x = 13.82 \quad x = 36.18$

$-25x^2 + 1250x - 5000 < 7500$

We need less than 13 ppl or more than 37 ppl

$x < 13.82 \sim x < 13$

$x > 36.18 \sim x > 37$

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Graphing Time!

$y < ax^2 + bx + c \qquad y > ax^2 + bx + c$

$y \leq ax^2 + bx + c \qquad y \geq ax^2 + bx + c$

Graphing Quadratic Inequalities

To graph a quadratic inequality

1. Graph the parabola that defines the boundary.
2. Use a solid parabola for $y \leq$ and $y \geq$ and a dashed parabola for $y <$ and $y >$.
3. Shade above the parabola for $y >$ or $\geq$ and below the parabola for $y \leq$ or $<$.

Graph $y \geq x^2 - 7x + 10$.

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More Graphs!

Graph the inequality.

$y \geq 2x^2 - 5x - 2$

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Try These!

a) $y < -2x^2 - 5x + 6$

b) $y \geq x^2 - 6x + 2$

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Pop Problem!

Shade the solution region for the system of inequalities.

$$\begin{cases} y \geq x^2 - 5 \\ y \leq 2x^2 - 4 \\ y \leq 4 \end{cases}$$

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