Graphing Quadratic Inequalities

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9:43 AM

PRE-CALCULUS 11
INEQUALITIES & SYSTEMS OF EQUATIONS
GRAPHING QUADRATIC INEQUALITIES

A. Definitions

    1. **quadratic inequality:** any quadratic inequality that can be written in the form:

$$ax^2 + bx + c < 0 \quad \text{or} \quad ax^2 + bx + c > 0 \qquad ax^2 + bx + c = 0$$

$$ax^2 + bx + c \le 0 \quad \text{or} \quad ax^2 + bx + c \ge 0$$

    where a, b, and c are constants and $a \ne 0$.

    2. **test point:** a graphical point used to determine the answer to an inequality.

B. Graphing a Quadratic Inequality

> **Rules**
>
> 1. Graph the inequality as if it was an equation using **broken line** (> or <) or **solid line** (≥ or ≤)
> 2. Use a test point like (0, 0) on one side of the function to determine which side of the function contains all of the acceptable answers that satisfy the inequality.

Graph the following inequalities.

~broken line.

1. $y > x^2 + 6x + 5$

$$y = x^2 + 6x + 5$$
$$-5 \qquad\qquad -5$$

$$y - 5 = x^2 + 6x + 9$$
$$+9$$

$$y + 4 = (x+3)^2 - 4.$$
$$-4$$

$$y = (x+3)^2 - 4$$

$$y > x^2 + 6x + 5$$
$$(0) > (0)^2 + 6(0) + 5$$
$$0 > 5$$
$$\text{False}$$

$y > x^2 + 6x + 5$

$y = (x+3)^2 - 4$

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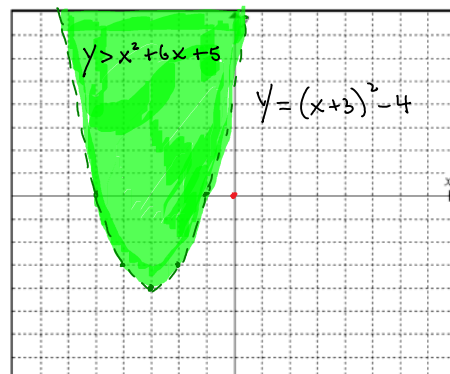
2. $y < x^2 + 6x + 5$ ← broken line

$y = x^2 + 6x + 5$

$y = (x+3)^2 - 4$

$y < x^2 + 6x + 5$

$(0) < (0)^2 + 6(0) + 5$

$0 < 5$

True.

$y = (x+3)^2 - 4$

$y < x^2 + 6x + 5$
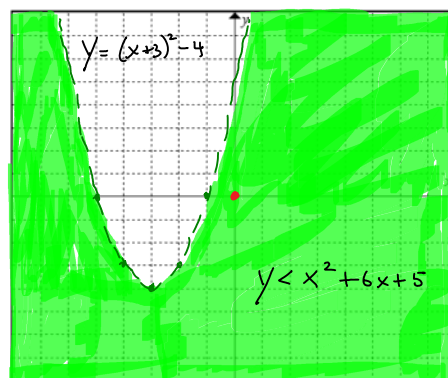
3. $y \geq -2x^2 + 8x$ ← solid line

$y = -2x^2 + 8x$

$y = -2(x^2 - 4x)$

$y^{-8} = -2(x^2 - 4x + 4)$

$y - 8 = -2(x-2)^2 + 8$

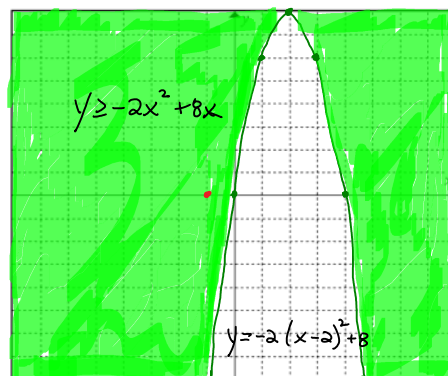$y = -2(x-2)^2 + 8$ Test $(-1, 0)$

$y \geq -2x^2 + 8x$

$0 \geq -2(-1)^2 + 8(-1)$

$0 \geq -10$

True.

$y \geq -2x^2 + 8x$

$y = -2(x-2)^2 + 8$

4. Write an inequality to describe the graph.

Vertex $(3, -4)$ point $(1, -2)$

$y = a(x - p)^2 + q$

$y = a(x - 3)^2 - 4$

$(-2) = a((1) - 3)^2 - 4$

$\begin{array}{r} -2 \\ +4 \end{array} = 4a \begin{array}{r} -4 \\ +4 \end{array}$

$\dfrac{2}{4} = \dfrac{4a}{4}$
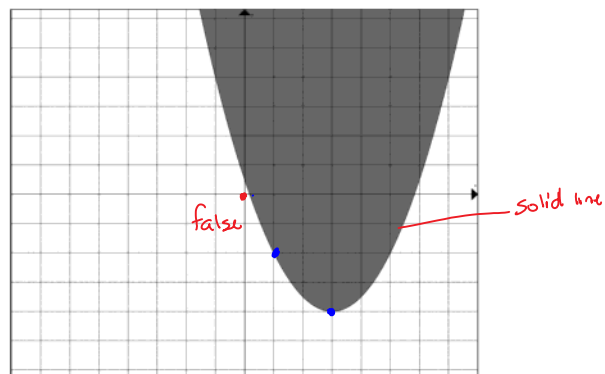
$a = \dfrac{1}{2}$

$y = \dfrac{1}{2}(x - 3)^2 - 4$

$y \;\boxed{}\; \dfrac{1}{2}(x - 3)^2 - 4$

$(0) \;\boxed{}\; \dfrac{1}{2}((0) - 3)^2 - 4$

$0 \;\boxed{\geq}\; \dfrac{1}{2}$

$\boxed{y \geq \dfrac{1}{2}(x - 3)^2 - 4}$

false

solid line

Assignment: Pg. 374 #4, 5, 6, 7, 10, 11