

NOTES: Section 4.9 – Graph and Solve Quadratic Inequalities

Goals: #1 - I can graph quadratic inequalities.



#2 - I can graph systems of quadratic inequalities.

Homework: Lesson 4.9 Worksheet

Warm Up:

1. Use the quadratic formula to solve $-x^2 + 8x = 20$

$$X = \frac{-8 \pm \sqrt{(8)^2 - 4(-1)(-20)}}{2(-1)} \quad -x^2 + 8x - 20 = 0$$

$$X = \frac{-8 \pm \sqrt{-16}}{-2}$$

$$X = 4 \pm 2i$$

$$X = \frac{-8 \pm 4i}{-2}$$

2. Find the discriminant of $2x^2 + 3x - 6 = 0$ and give the number and type of solutions to the equation.

$$b^2 - 4ac$$

$$(3)^2 - 4(2)(-6)$$

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Two Real
Solutions

3. An object is thrown upward from a height of 15 feet at an initial velocity of 35 feet per second. How long will it take for the object to hit the ground?

$$h = -16t^2 + v_0t + h_0$$

$$0 = -16t^2 + 35t + 15$$

$$t = \frac{-35 \pm \sqrt{(35)^2 - 4(-16)(15)}}{2(-16)}$$

$$t = \frac{-35 \pm \sqrt{2185}}{-32}$$

$$t \approx -0.367 \quad t \approx 2.55 \text{ sec}$$

Review:

The two differences between graphing equations and graphing inequalities are:

- solid or dashed
- shading

This is the same for graphing quadratic inequalities.

Example #1: Graph the following quadratic inequalities.

1. $y > x^2 + 3x - 4$
↳ dashed

2. $y \geq -(x - 3)(x + 1)$
↳ solid

AOS: $x = -1.5$

AOS: $x = 1$

Vertex: $(-1.5, -6.25)$

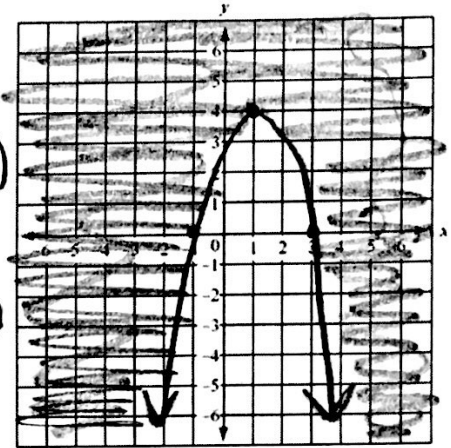
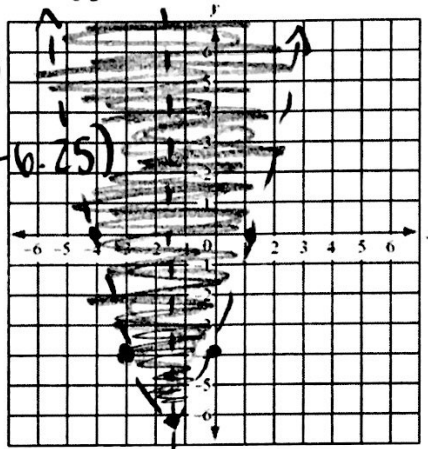
Vertex: $(1, 4)$

$$x = \frac{-b}{2a} = \frac{-3}{2(1)} = -1.5$$

$$x\text{-int: } 3, -1$$

$$x = \frac{p+q}{2} = \frac{3+(-1)}{2} = 1$$

x	y
0	-4
1	0



You practice: Graph the following quadratic inequalities.

3. $y < -x^2 + 4x + 2$
↳ dashed

4. $y \geq \frac{1}{2}(x - 3)^2 + 2$
↳ solid

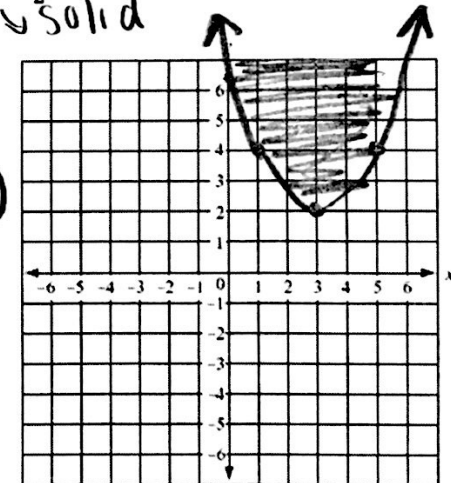
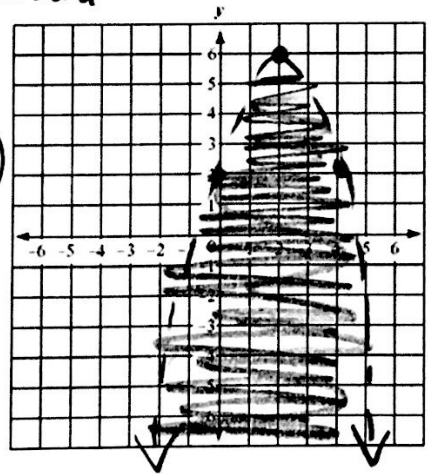
AOS: $x = 2$

AOS: $x = 3$

Vertex: $(2, 6)$

Vertex: $(3, 2)$

$$x = \frac{-b}{2a} = \frac{-4}{2(-1)} = 2$$



Notes:

A system of quadratic inequalities consists of two quadratic inequalities.

The solution of a system of inequalities is the graph of all solutions of the system (the region where the shading overlaps).

Example #2: Graph the system of quadratic inequalities.

1. $y \leq -x^2 + 4$ ^{solid}

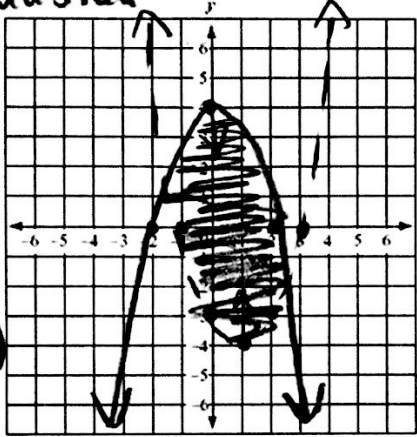
$y > x^2 - 2x - 3$ ^{dashed}

$y \leq -x^2 + 4$
vertex: (0, 4)

$$\begin{array}{r|l} x & y \\ \hline -2 & 0 \end{array}$$

$y > x^2 - 2x - 3$
vertex: (1, -4)

$$\begin{array}{r|l} x & y \\ \hline -1 & 0 \end{array}$$



2. $y > (x+1)(x+3)$ ^{dashed}

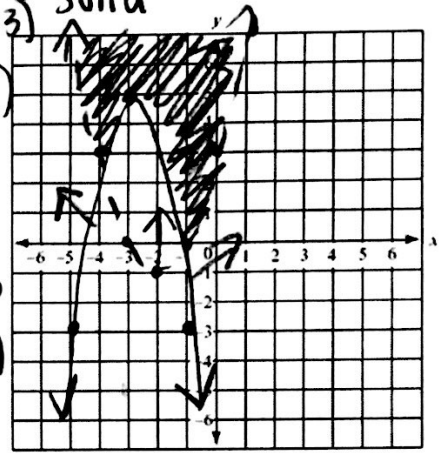
$y \geq -2(x+3)^2 + 5$ ^{solid}

$y > (x+1)(x+3)$
vertex: (-2, -1)

$$\begin{array}{r|l} x & y \\ \hline 0 & 3 \end{array}$$

$y \geq -2(x+3)^2 + 5$
vertex: (-3, 5)

$$\begin{array}{r|l} x & y \\ \hline -1 & -3 \end{array}$$



You practice: Graph the system of quadratic inequalities.

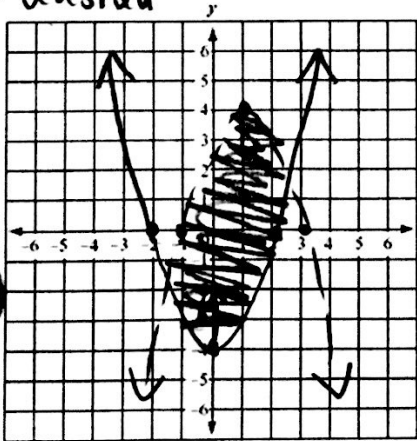
1. $y \geq x^2 - 4$ ^{solid}

$y < -(x-3)(x+1)$ ^{dashed}

$y \geq x^2 - 4$
vertex: (0, -4)

$$\begin{array}{r|l} x & y \\ \hline 2 & 0 \end{array}$$

$y < -(x-3)(x+1)$
vertex: (1, 4)



2. $y \leq -x^2 + 4x - 4$ ^{solid}

$y < 2x^2 + x - 8$ ^{dashed}

$y \leq -x^2 + 4x - 4$
vertex: (2, 0)

$$\begin{array}{r|l} x & y \\ \hline 1 & -1 \end{array}$$

$y < 2x^2 + x - 8$
vertex: (-1/4, -8.375)

$$\begin{array}{r|l} x & y \\ \hline 1 & -5 \\ -2 & -2 \end{array}$$

