Name: ____________________________ Date: ______________

Quadratic Inequalities in Two Variables
Algebra 2 with Trigonometry

Solving quadratic inequalities of one variable, typically x, involved finding the set of all values of that variable that made a particular inequality true. Likewise, solving a quadratic inequality of two variables simply implies finding, graphically, all (x, y) coordinate pairs that make a particular inequality true.

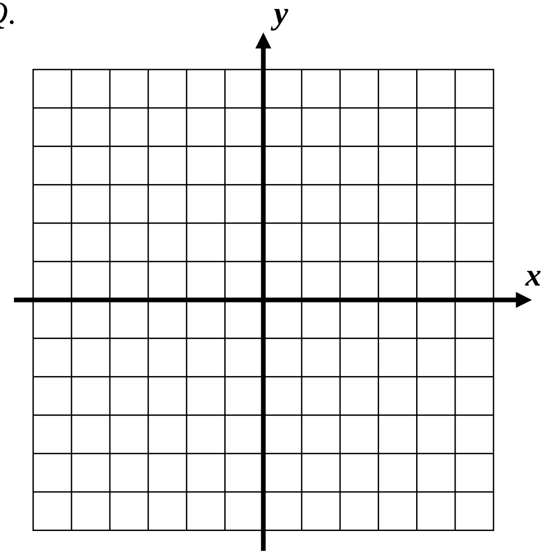
***Exercise* #1:** For the quadratic inequality $y > x^2 - 4$ answer each of the following questions.

(a) Specify whether each of the following points lies in the solution set.

$(1, 4)$ $(2, 0)$ $(-2, 1)$

(b) Do the points on the parabola $y = x^2 - 4$ fall in the solution set of this inequality? Explain.

(c) Sketch the inequality below. Label its solution set Q.

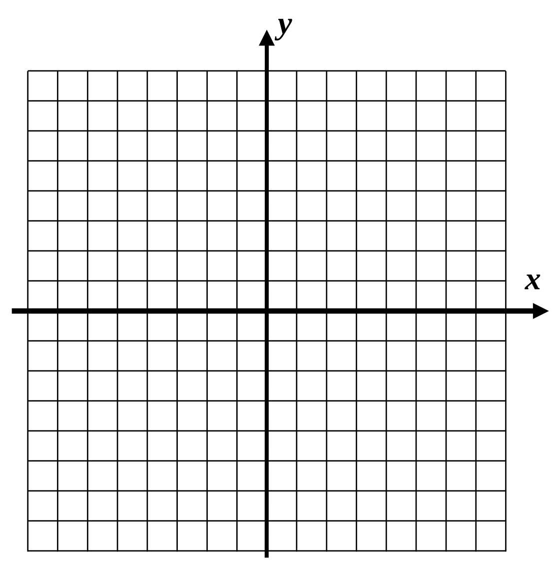


Just as in Algebra 1, we can graph a system of inequalities by finding where the solution set of two inequalities intersects.

***Exercise* #2:** Sketch the solution set of the system of quadratic inequalities given below. Label the solution set A. State one point that lies in the solution set.

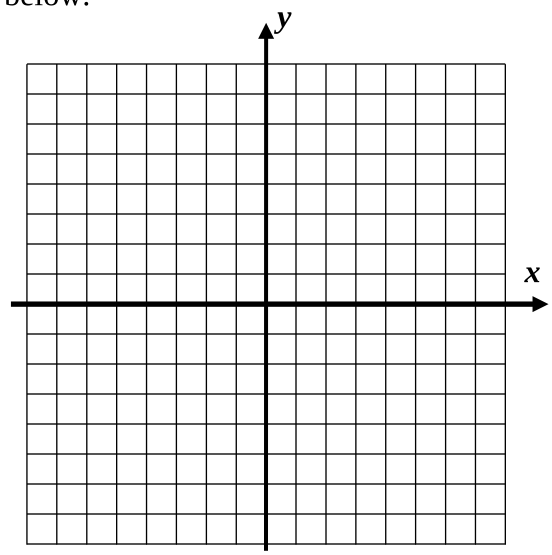
$y < 6 - x^2$

$y \geq x^2 - 4x + 3$



***Exercise* #3:** Graph the region described by the inequality given below.

$x^2 - 4 < y \leq 5$



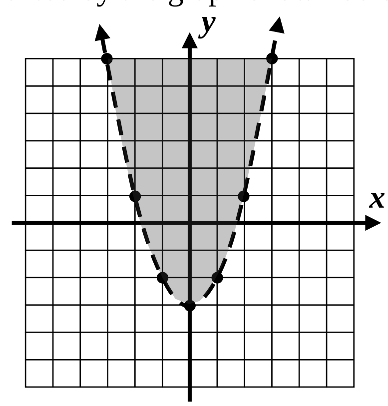
***Exercise* #4:** Which of the following inequalities is represented by the graph shown below?

(1) $y < x^2 - 3$

(2) $y \leq x^2 - 3$

(3) $y > x^2 - 3$

(4) $y \geq x^2 - 3$



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***Exercise* #5:** An arch bridge crosses a 600-foot span above a river. Its structure, as viewed from the side, occupies the two-dimensional space given by the set of inequalities shown below. Produce a sketch showing the side-view of the bridge. Label all relevant features of the graph.

$$0 \leq x \leq 600 \text{ and } \frac{600x - x^2}{360} \leq y \leq 300$$

Name: ________________________________ Date: ________________

QUADRATIC INEQUALITIES IN TWO VARIABLES
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Which of the following points lies in the solution set of $y < 2x^2 - 10x$?

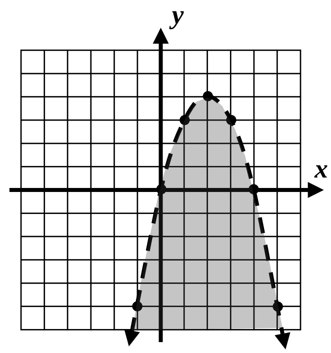
(1) the origin (3) $(4, 2)$

(2) $(1, -6)$ (4) $(-1, 4)$ ________

2. Which of the inequalities describes the shaded region shown below?

(1) $y < 4x - x^2$ (3) $y > 4x - x^2$

(2) $y < x^2 - 4x$ (4) $y \geq x^2 - 4x$



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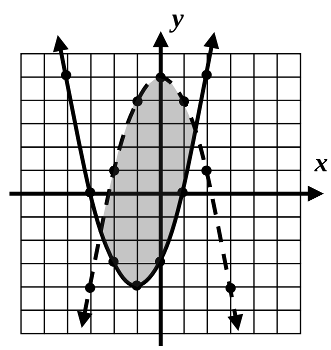
3. Which of the inequalities describes the shaded area below?

(1) $5 - x^2 < y \leq x^2 - 2x - 3$

(2) $x^2 - 2x - 3 \leq y < 5 - x^2$ S

(3) $5 - x^2 \leq y < x^2 - 2x - 3$

(4) $x^2 - 2x - 3 < y \leq 5 - x^2$



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4. Which of the following points does not lie in the solution set of $y + 4 \geq x^2 - 2$?

(1) $(-3, 7)$ (3) $(3, 3)$

(2) $(4, 8)$ (4) $(-6, 40)$ ________

5. Which of the following points does *not* lie in the solution set of the inequality $x^2 - 2x - 1 < y \leq -x^2 + 2x + 5$?

(1) $(0, 0)$ (3) $(-1, 2)$

(2) $(2, 5)$ (4) $(1, -1)$

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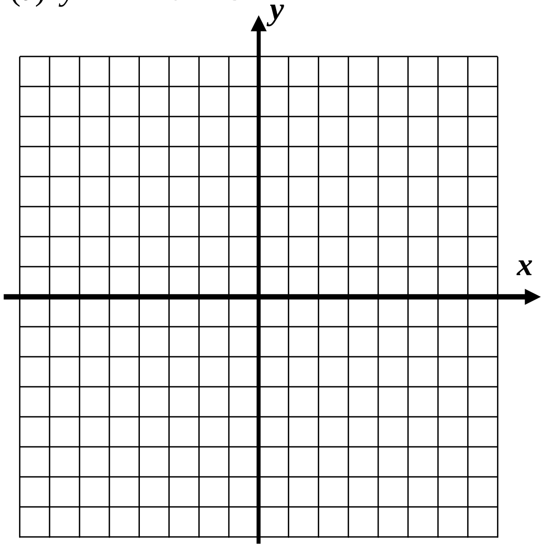
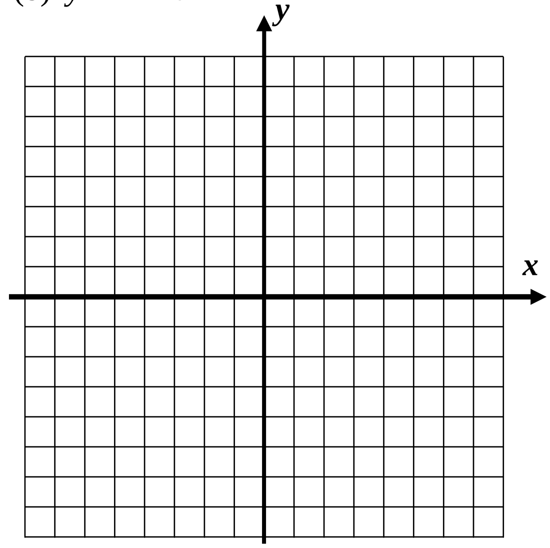
6. Sketch the solution set of each inequality shown below. Label the solution set A.

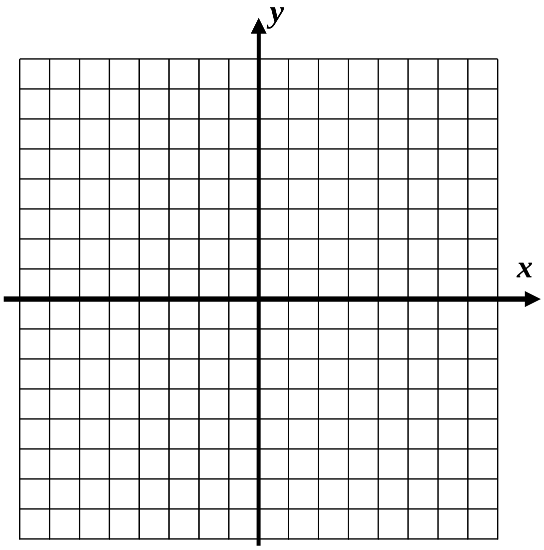
(a) $y > x^2 + 6x + 3$



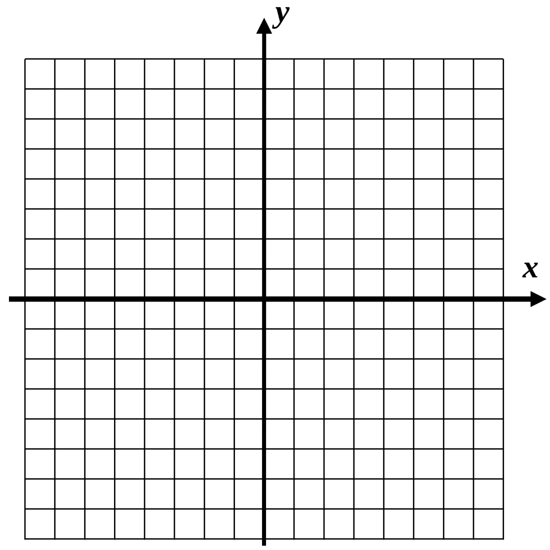
(b) $y \le x^2 - 6x + 1$



(c) $x^2 - 5 < y \le 3 - x^2$



(d) $y \le -x^2 - 6x - 7$ or $y \ge x^2 - 4x + 8$



APPLICATIONS

7. The entrance to a tunnel through a mountain is shaped like a parabola whose equation is $y = \dfrac{120x - 4x^2}{75}$, where x represents the horizontal distance across the roadway and y represents the height of the top of the opening. To the right, sketch the region given by $0 \le y \le \dfrac{120x - 4x^2}{75}$. Show the width of the region as well as its height.