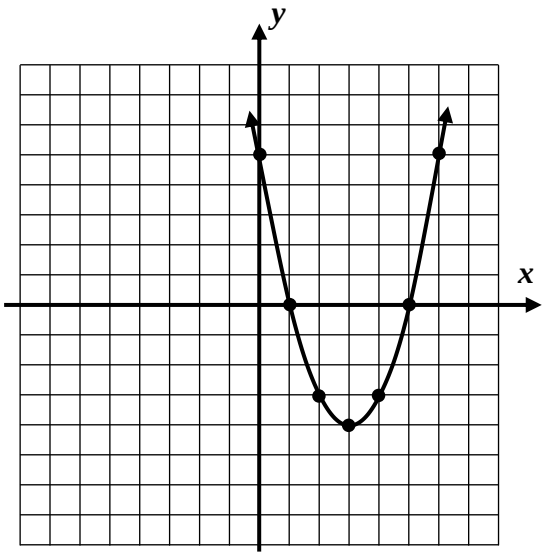
Name: _____ Date: _____

REFLECTING PARABOLAS
ALGEBRA 2 WITH TRIGONOMETRY

Reflecting functions in across the *x* and *y* axes is an important mathematical process that will be explored in this lesson specifically for parabolas. The first exercise gets at both of these important transformations.

***Exercise* #1:** The parabola $f(x)=x^2-6x+5$ is shown on the grid below.



(a) Consider the function $g(x)=-f(x)$. Determine a formula for $g(x)$ and graph it on the grid below.

(b) How was the graph of *f* transformed to produce the graph of *g*?

(c) Now consider the function $h(x)=f(-x)$. Determine a formula for $h(x)$ and graph it on the grid above.

(d) How was the graph of *f* transformed to produce the graph of *h*?

REFLECTING FUNCTIONS IN THE *X* AND *Y* AXES

The function $-f(x)$ is a reflection of $f(x)$ in the *x*-axis.

The function $f(-x)$ is a reflection of $f(x)$ in the *y*-axis.

***Exercise* #2:** Determine an equation for the linear function $g(x)=5x-7$ both after a reflection in the *x*-axis and *y*-axis. Label your equations.

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***Exercise* #3:** If a parabola has the equation $f(x)=2x^2-3x+8$, which of the following represents its equation after a reflection in the *x*-axis?

(1) $y=2x^2+3x+8$ (3) $y=-2x^2+3x+8$

(2) $y=-2x^2+3x-8$ (4) $y=2x^2-3x-8$ _____

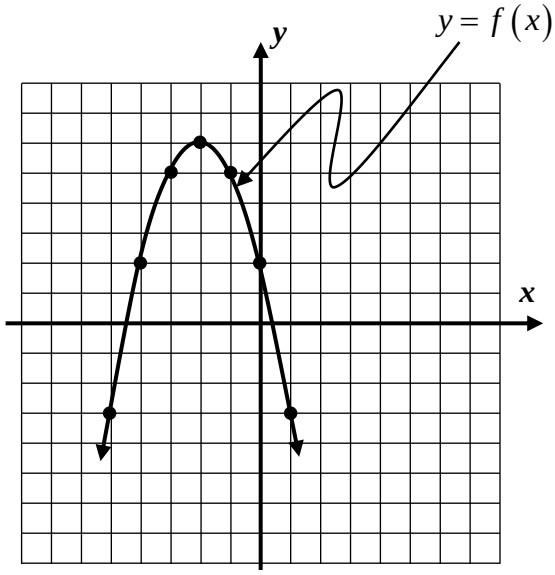
***Exercise* #4:** After a reflection in the *y*-axis, the quadratic function $g(x)=4x^2-7x+2$ would have the equation

(1) $y=-4x^2+7x+2$ (3) $y=4x^2+7x+2$

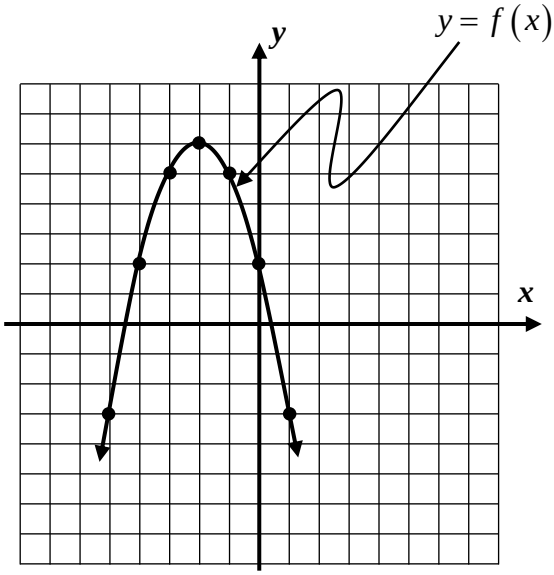
(2) $y=-4x^2+7x-2$ (4) $y=4x^2+7x-2$ _____

***Exercise* #5:** Consider the function $g(x)=-x^2+4$. What two transformations have occurred to the graph of $y=x^2$ to produce the graph of *g*? Specify the transformations and the order in which they occurred. Note that there exists more than one correct answer. Graph on your calculator to verify.

***Exercise* #6:** The graph of a function $f(x)$ is shown below on two grids. Sketch (a) the graph of $-f(x)$ and (b) the graph of $f(-x)$.



(a) Graph and label $-f(x)$



(b) Graph and label

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REFLECTING PARABOLAS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Which of the following equations would represent the graph of the parabola $y = 3x^2 - 4x - 1$ after a reflection in the *x*-axis?

   (1) $y = -3x^2 - 4x - 1$ (3) $y = 3x^2 + 4x - 1$

   (2) $y = -3x^2 + 4x - 1$ (4) $y = -3x^2 + 4x + 1$ _____

2. The graph of $y = 10 - x^2$ represents the graph of $y = x^2$ after

   (1) a vertical shift of 10 units followed by a reflection in the *x*-axis.
   (2) a reflection in the *x*-axis followed by a vertical shift of 10 units.
   (3) a leftward shift of 10 units followed by a reflection in the *y*-axis.
   (4) a reflection across the *x*-axis followed by a rightward shift of 10 units. _____

3. If $f(x) = -2x^2 + 5x - 3$ and $g(x)$ is the reflection of $f(x)$ across the *y*-axis, then an equation of *g* is which of the following?

   (1) $g(x) = -2x^2 - 5x - 3$ (3) $g(x) = 2x^2 + 5x - 3$

   (2) $g(x) = -2x^2 + 5x + 3$ (4) $g(x) = 2x^2 + 5x + 3$ _____

4. If the point $(-3, -5)$ lies on the graph of a function $h(x)$ then which of the following points *must* lie on the graph of the function $-h(x)$?

   (1) $(3, 5)$ (3) $(-5, -3)$

   (2) $(-3, 5)$ (4) $(3, -5)$ _____

5. If the function $y = -f(x - 4)$ were graphed, it would represent which of the following transformations to the graph of $y = f(x)$?

   (1) A rightward shift of 4 units followed by a reflection in the *x*-axis.
   (2) A rightward shift of 4 units followed by a reflection in the *y*-axis.
   (3) A downward shift of 4 units followed by a reflection in the *x*-axis.
   (4) A leftward shift of 4 units followed by a reflection in the *y*-axis. _____

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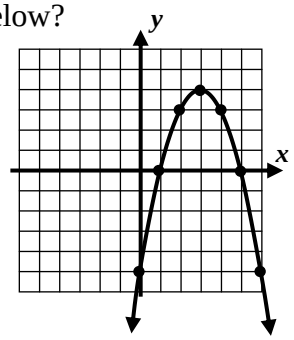
6. After a reflection in the *x*-axis, the parabola $y = x^2 - 4$ would have the equation

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

(2) $y = -x^2 - 4$ (4) $y = x^2 - 8$ _____

7. Which of the following equations represents the graph shown below?

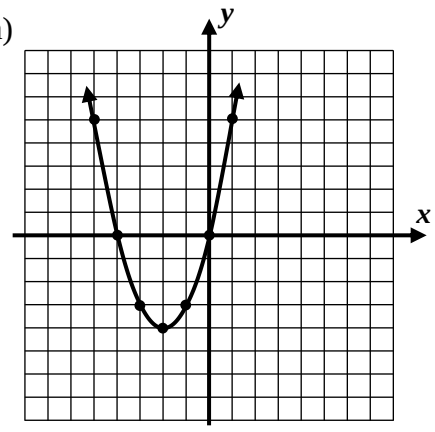


(1) $y = (x+3)^2 + 4$ (3) $y = -(x-3)^2 + 4$

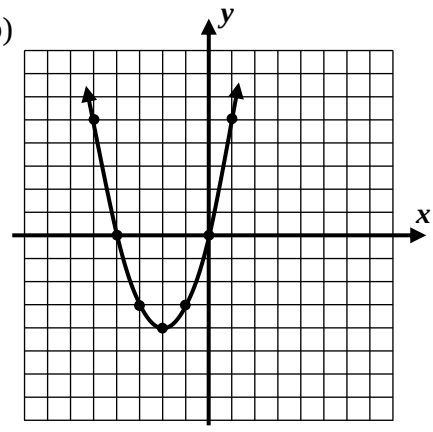
(2) $y = -(x+3)^2 + 4$ (4) $y = (-x-3)^2 - 4$ _____

8. The graph of $f(x) = x^2 + 4x$ is show below on two separate grids. Give an equation and sketch a graph for the functions (a) $f(-x)$ and (b) $-f(x)$.

(a)



(b)



REASONING

9. How would the graph of the function $h(x)$ compare to the graph of $f(x)$ if *h* is defined by the formula $h(x) = -f(-x)$. Explain your reasoning.