Name: _____ Date: _____

INTRODUCTION TO QUADRATIC FUNCTIONS
ALGEBRA 2 WITH TRIGONOMETRY

Linear functions are used throughout mathematics and science due to their simplicity and applicability. **Quadratic functions** comprise another very important category of functions.

QUADRATIC FUNCTIONS

Any function of the form $f(x) = ax^2 + bx + c$ where the leading coefficient, *a*, is not zero.

The key difference between linear and quadratic function is the inclusion of the **quadratic term**, ax^2.

***Exercise* #1:** *Without* the use of your calculator, evaluate each of the following quadratic functions for the specified input values. Recall that, according to the formal Order of Operations, exponent evaluation should always come first.

(a) $f(x) = x^2$ (b) $g(x) = 2x^2 - 5$ (c) $h(x) = -x^2 + 4x$

$f(-3) =$ $g(2) =$ $h(-2) =$

$f(5) =$ $g(-1) =$ $h(3) =$

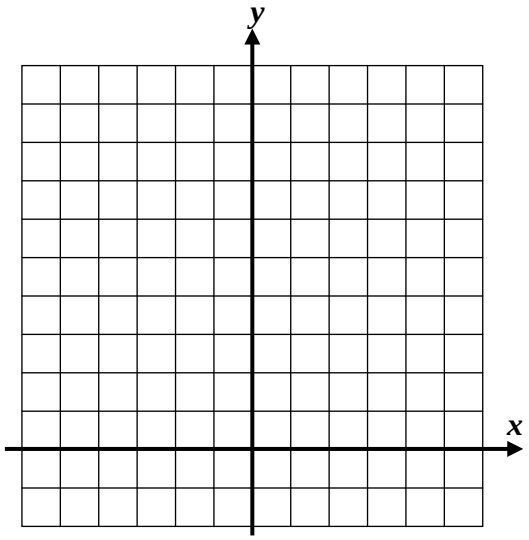
Graphs of quadratic functions form what are known as **parabolas**. The simplest quadratic function, and one that you should be very familiar with, is reviewed in the next exercise.

***Exercise* #2:** Consider the simplest of all quadratic functions $y = x^2$.

(a) Create a table of values to plot this function over the domain interval $-3 \le x \le 3$.

x	−3	−2	−1	0	1	2	3
$y = x^2$							

(b) Sketch a graph of this function on the grid to the right.



(c) State the coordinates of the **turning point** of this parabola.

(d) State the equation of this parabola's **axis of symmetry**.

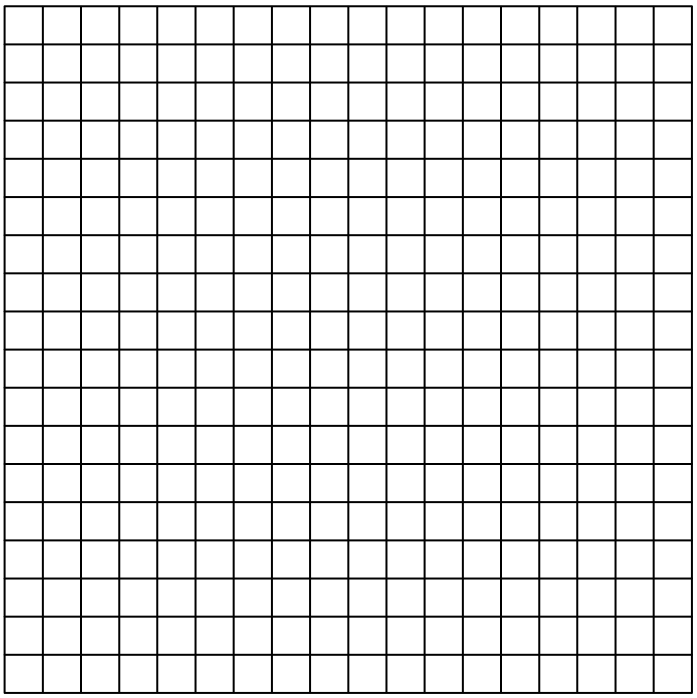
All quadratic functions that have unlimited domains (domains that consist of the set of all real numbers) have turning points and an axis of symmetry. It is important to be able to sketch a parabola using your graphing calculator to generate a table of values.

***Exercise* #3:** Consider the quadratic function $f(x) = -x^2 + 6x + 5$.

(a) Using a **TABLE** on your graphing calculator, determine the turning point of this function.

(b) What is the equation of the axis of symmetry of this quadratic?

(c) Graph this function of the grid to the right. Give careful consideration to placing your axes so that all intercepts and the turning point are shown.



(d) Why does this parabola open downward as opposed to $y = x^2$ which opened upward?

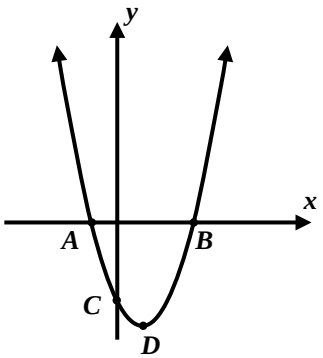
(e) Between what two consecutive integers does the larger solution to the equation $-x^2 + 6x + 5 = 0$ lie? Show this point on your graph.

***Exercise* #4:** A sketch of the quadratic function $y = x^2 - 11x - 26$ is shown below marked with points at its intercepts and its turning point. Using tables or a graph on your calculator, determine the coordinates for each of the points.

The *x*-intercepts: *A* *B*

The *y*-intercept: *C*

The turning point: *D*



Name: _____ Date: _____

INTRODUCTION TO QUADRATIC FUNCTIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Without the use of your calculator, evaluate each of the following quadratic functions for the specified input values.

(a) $g(x) = x^2 - 9$

$g(5) =$

$g(-3) =$

(b) $f(x) = -2x^2 + 8x$

$f(3) =$

$f(-1) =$

(c) $h(x) = x^2 - 2x + 6$

$h(0) =$

$h(-2) =$

2. Which of the following represents the *y*-intercept of the graph of the quadratic function $y = 2x^2 - 7x + 9$? (Recall, that the *y*-intercept of a graph **always** occurs when $x = 0$.)

(1) 7 (3) -7

(2) 2 (4) 9 _____

3. For a particular quadratic function, the leading coefficient is *negative* and the function has a turning point whose coordinates are $(-3, 14)$. Which of the following must be the *range* of this quadratic?

(1) $\{y \mid y \geq -3\}$ (3) $\{y \mid y \leq 14\}$

(2) $\{y \mid y \leq -3\}$ (4) $\{y \mid y \geq 14\}$ _____

4. A parabola has one *x*-intercept of $x = -2$ and an axis of symmetry of $x = 4$. Which of the following represents its other *x*-intercept? (Hint, think of how far the given *x*-intercept is away from the axis.)

(1) $x = 3$ (3) $x = 6$

(2) $x = 10$ (4) $x = 8$ _____

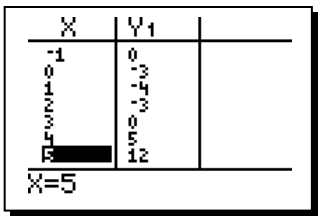
5. A table is shown below for selected values that satisfy a quadratic function. Which of the following statements is *not* true about the function based on this table?

(1) The function has an *x* intercept of 3.

(2) The function has a *y*-intercept of -3.

(3) The function's leading coefficient is negative.

(4) The function has a turning point of $(1, -4)$



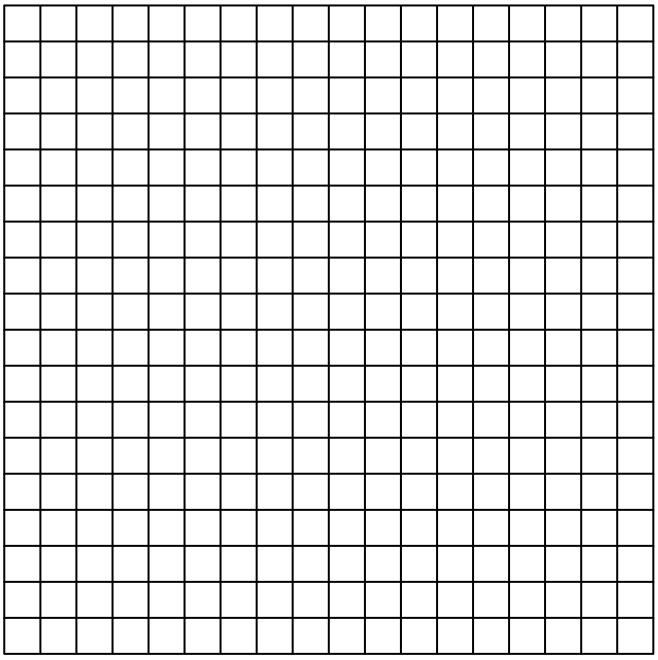
_____

6. Consider the quadratic function whose equation is $f(x) = x^2 + 4x - 4$.

(a) Determine the turning point of this quadratic using a table on your calculator.

(b) Create a graph of the quadratic on the grid to the right. Be sure to position your axes in such a way that your graphs shows all intercepts and the turning point.

(c) State the equation of the axis of symmetry of this quadratic function and graph it on the grid.



APPLICATIONS

7. The number of meters above the ground, *h*, of a projectile fired at an initial velocity of 86 meters per second and at an initial height of 6.2 meters is given by $h(t) = -4.9t^2 + 86t + 6.2$, where *t* represents the time, in seconds, since the projectile was fired. If the projectile hits its peak height at $t = 8.775$ seconds, which of the following is closest to its greatest height?

(1) 265 meters (3) 422 meters

(2) 384 meters (4) 578 meters _____

8. Physics students were modeling the height of a ball once it was dropped from the roof of a 25 story building. The students found that the height in feet, *h*, of the ball above the ground as a function of the number of seconds, *t*, since it was dropped was given by $h(t) = 300 - 16t^2$.

From what height was the ball dropped?

To the nearest *tenth* of a second, determine the time at which the ball hits the ground. Provide evidence from a table to support your answer.