

Math 1010 TNG ~ Quadratic Activity Lab

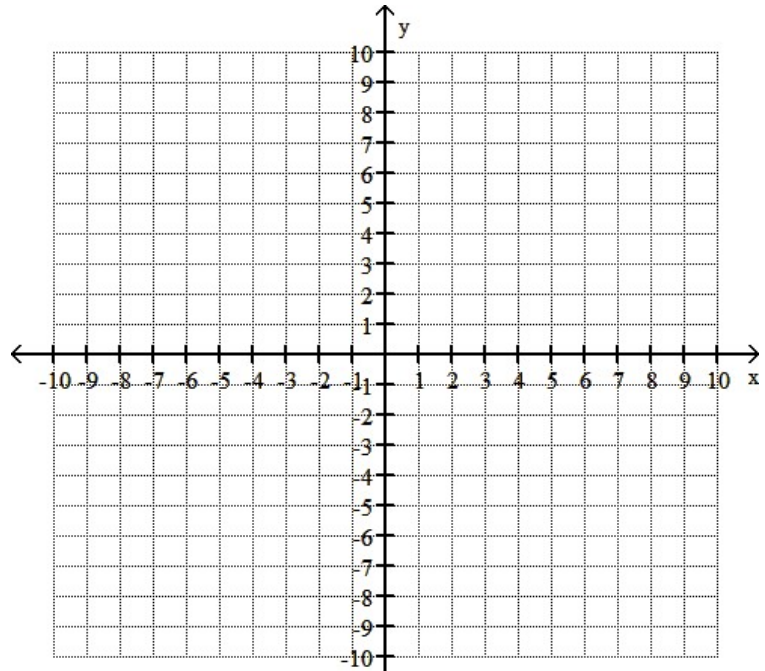
This activity we will learn how to graph the quadratic function which is called the parabola, $f(x) = ax^2 + bx + c$.

The most basic quadratic function is $f(x) = ax^2$

Let's look at the function when $a = 1$

Fill out the table and then plot the points and graph the following function:

x	$f(x) = x^2$	$(x, f(x))$
-3		
-2		
-1		
0		
1		
2		
3		



Make sure your graph has a nice “rounded” curve at the bottom.

Go to the following link:

<http://www.mathopenref.com/quadraticexplorer.html>

Click “zero” under all three sliders.

Moving the “a” slider:

1. As you move “a” up and down:
 - a. Describe what happens to the quadratic function when “a” is a positive number.

- b. Describe what happens to the quadratic function as you allow “a” to get very close to $a = 0$, but leave “a” positive?

- c. Describe what happens to the quadratic function as you allow “a” to get larger in the positive direction.

- d. Describe what happens to the quadratic function when “a” is a negative number.

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- e. Describe what happens to the quadratic function as you allow “a” to get very close to $a = 0$ but leave “a” negative?

- f. Describe what happens to the quadratic function as you allow “a” to get larger in the negative direction.

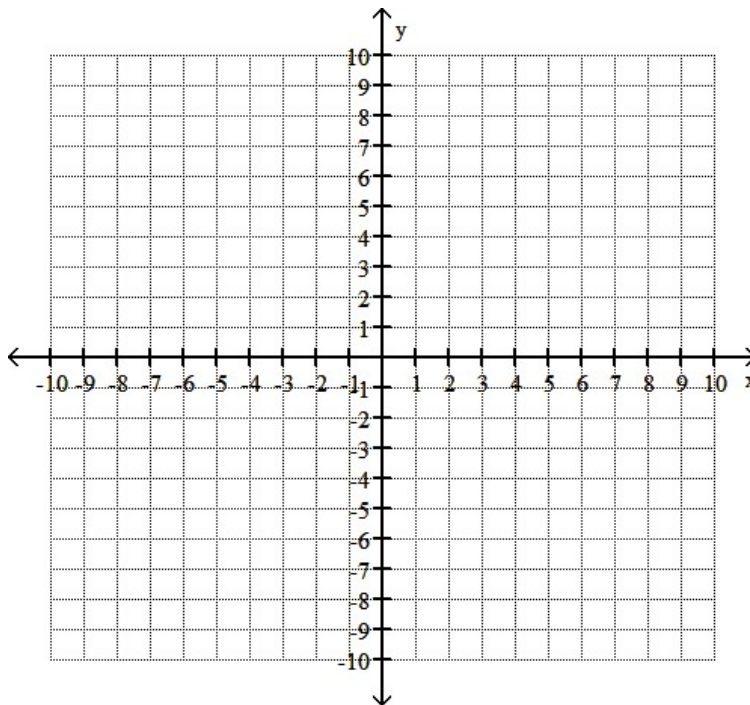
2. Generalize what happens as you move “a”.

Let's look at the function when "a" is a different number.

$$f(x) = 2x^2$$

Fill out the table and then plot the points and graph the following function:

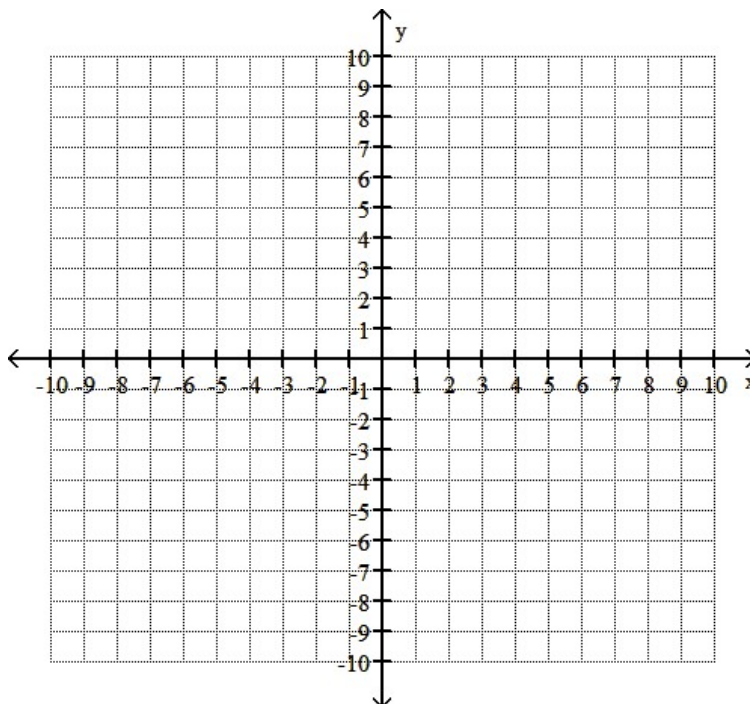
x	$f(x) = 2x^2$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		



$$f(x) = \frac{1}{2}x^2$$

Fill out the table and then plot the points and graph the following function:

x	$f(x) = \frac{1}{2}x^2$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		



Go back to the link and put the “a” slider to $a = 1$ and the “c” slider to $c = 0$.

Moving the “b” slider:

3. As you leave both “a” and “c” alone, move “b” up and down:
 - a. Describe what happens to the quadratic function when “b” is a positive number.

 - b. Describe what happens to the quadratic function when “b” is a negative number.

 - c. Describe what happens to the quadratic function as you allow “b” to get larger in the positive direction.

 - d. Describe what happens to the quadratic function as you allow “b” to get larger in the negative direction.

 - e. Now let $a = -1$ and try # a-d again.

4. Generalize what happens as you move “b”.

Put the “a” slider to $a = 1$ and the “b” slider to $b = 0$.

Moving the “c” slider:

5. As you leave both “a” and “b” alone, move “c” up and down:
 - a. Describe what happens to the quadratic function when “c” is a positive number.

- b. Describe what happens to the quadratic function when “c” is a negative number.

 - c. Describe what happens to the quadratic function as you allow “c” to get larger in the positive direction.

 - d. Describe what happens to the quadratic function as you allow “c” to get larger in the negative direction.

 - e. Now let $a = -1$ and try a-d again.
6. Generalize what happens as you move “c”.

Play for a moment with all three sliders.

Let’s now look at the quadratic function in a different form:

$$f(x) = a(x - h)^2 + k$$

We call the point (h, k) the vertex of the parabola.

Let’s once again go to a link and explore:

<http://www.mathopenref.com/quadvertexexplorer.html>

Click “zero” under all three sliders.

Moving the “a” slider:

7. Generalize what happens as you move “a”.

8. Do you think the “a” in this form behaves like the “a” in the standard form? Why or why not?

Put the “a” slider to $a = 1$ and the “k” slider to $k = 0$.

Moving the “h” slider:

9. As you leave both “a” and “k” alone, move “h” up and down:
a. Describe what happens to the quadratic function when “h” is a positive number.

b. Describe what happens to the quadratic function when “h” is a negative number.

c. Now let $a = -1$ and try # a and # b again.

10. Generalize what happens as you move “h”.

Put the “a” slider to $a = 1$ and the “h” slider to $h = 0$.

Moving the “k” slider:

11. As you leave both “a” and “h” alone, move “k” up and down:

a. Describe what happens to the quadratic function when “k” is a positive number.

- b. Describe what happens to the quadratic function when “k” is a negative number.
- c. Now let a = -1 and try # a and # b again.

12. Generalize what happens as you move “k”.

13. Generalize about the formula $f(x) = a(x - h)^2 + k$

Play for a moment with all three sliders.

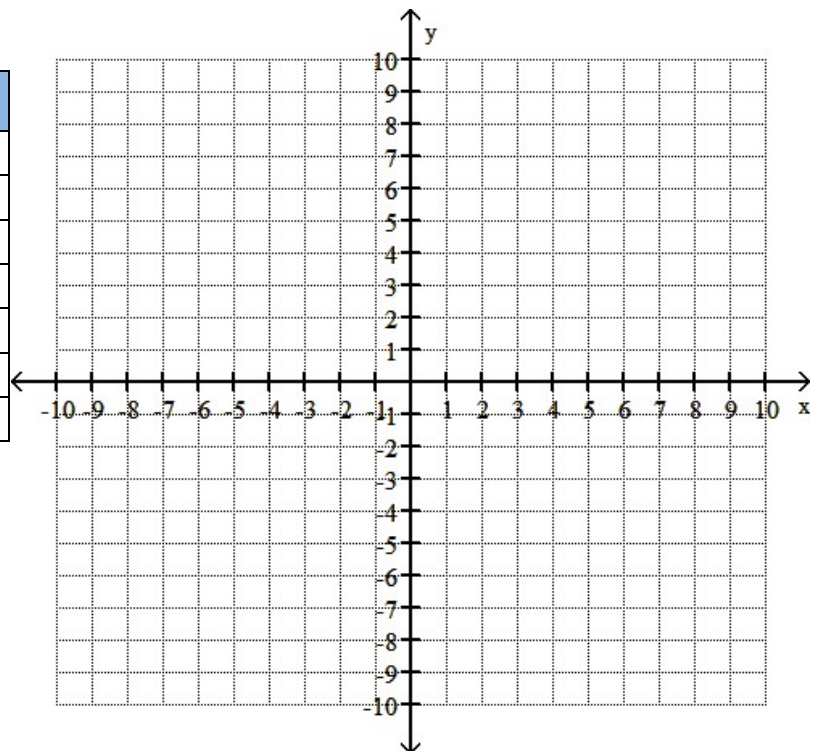
Let’s graph when “h” and “k” are different numbers.

If you need help, go back to the link. And put in the appropriate numbers.

$$f(x) = 1(x - 1)^2 + 2$$

Fill out the table and then plot the points and graph the following function:

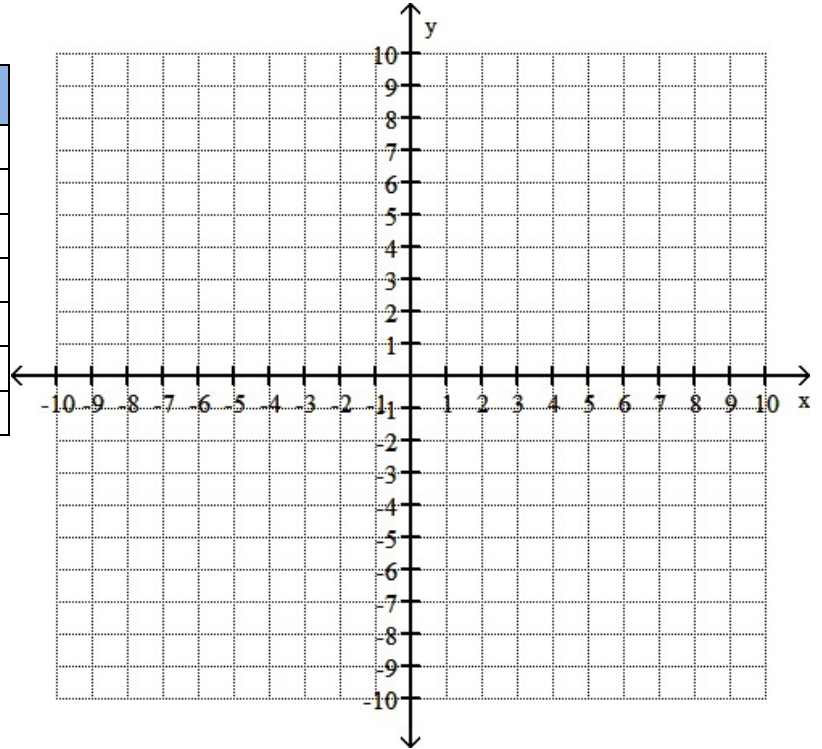
x	$f(x) = 1(x - 1)^2 + 2$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		



$$f(x) = -1(x - 1)^2 + 2$$

Fill out the table and then plot the points and graph the following function:

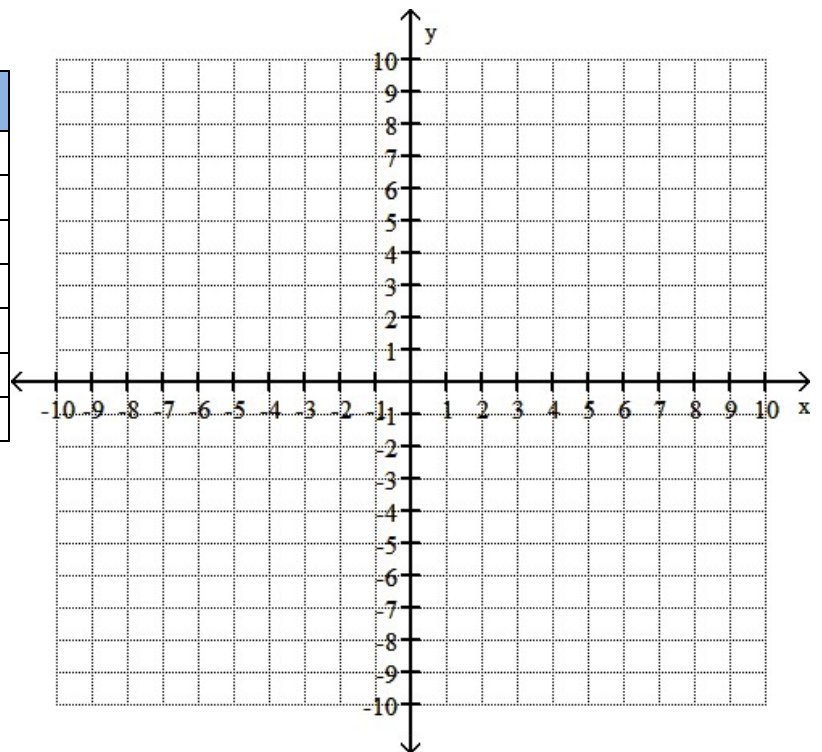
x	$f(x) = -1(x - 1)^2 + 2$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		



$$f(x) = 1(x + 1)^2 - 3$$

Fill out the table and then plot the points and graph the following function:

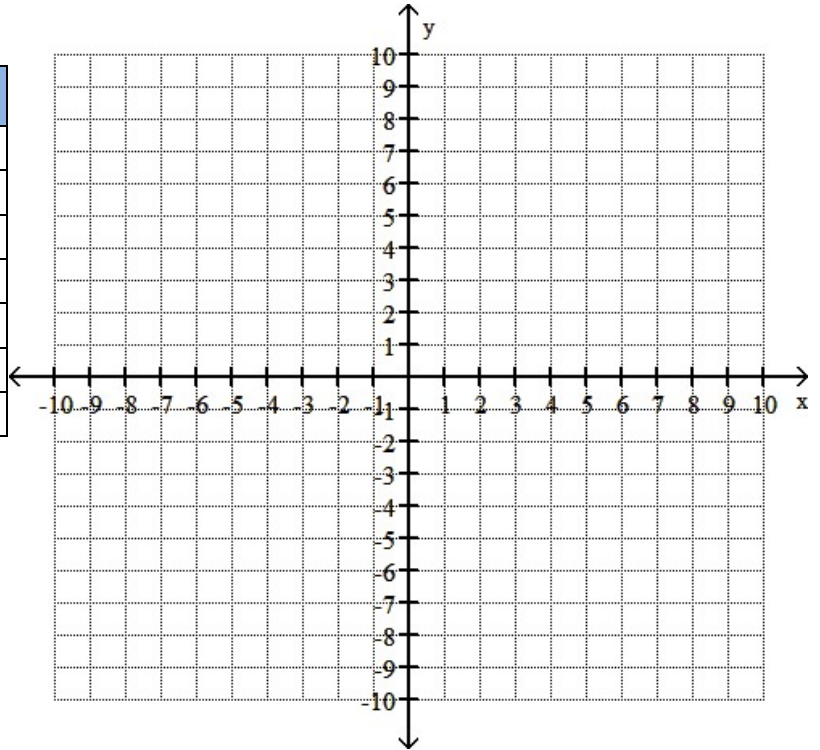
x	$f(x) = 1(x + 1)^2 - 3$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		



$$f(x) = -1(x + 1)^2 - 3$$

Fill out the table and then plot the points and graph the following function:

x	$f(x) = -1(x + 1)^2 - 3$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		



$$f(x) = -2(x + 3)^2 - 5$$

Fill out the table and then plot the points and graph the following function:

x	$f(x) = -2(x + 3)^2 - 5$	(x, f(x))
-3		
-2		
-1		
0		
1		
2		
3		

