

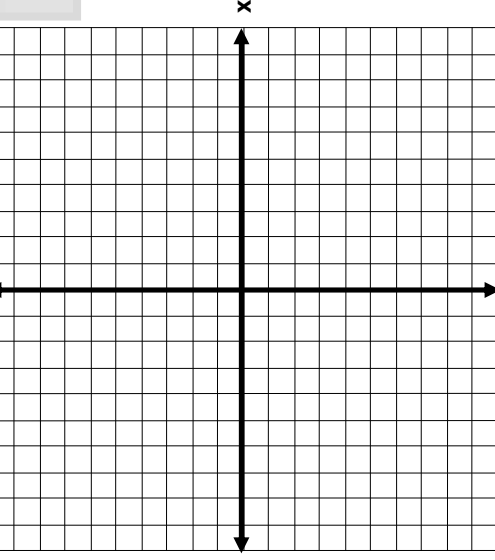
# Quadratic Function $f(x) = x^2$

## Transformations - Quadratic Functions

The graph of a quadratic function is called a \_\_\_\_\_.

Use a table of values to graph  $y = x^2$ .

x	$f(x) = x^2$	y	(x, y)
-2	( ) <sup>2</sup>		(__, __)
-1	( ) <sup>2</sup>		(__, __)
0	( ) <sup>2</sup>		(__, __)
1	( ) <sup>2</sup>		(__, __)
2	( ) <sup>2</sup>		(__, __)



Vertical Translation

Identify the domain of the graph.

Identify the range of the graph.

Does the graph have a max/min?

Describe the end behavior of the graph.

What are the zeros of the function?

What is the y - intercept of the function?

How could this graph be shifted up or down?

How could this graph be shifted left or right?

How can you tell this is a quadratic function?

How are the graphs alike?

How are the graphs different?

Write the equation of a function in this family with a y-intercept of -3?

Write the equation of a function in this family with a y-intercept of + 7?

Write the equation of a function in this family with a y-intercept of -10?

# Quadratic Functions in the Form of $f(x) = x^2 + k$

Complete the table and graph each in a different color on the graph to the right. (Sketch parent graph  $f(x) = x^2$  in pencil.)

$f(x) = x^2 + 2$	
x	f(x)
-2	
-1	
0	
1	
2	
y-int=	

$f(x) = x^2 - 4$	
x	f(x)
-2	
-1	
0	
1	
2	
y-int=	

$f(x) = x^2 + 1$	
x	f(x)
-2	
-1	
0	
1	
2	
y-int=	

$f(x) = x^2 - 1$	
x	f(x)
-2	
-1	
0	
1	
2	
y-int=	

# Transformations - Quadratic Functions

**Quadratic Functions in the Form of  $f(x) = ax^2$**

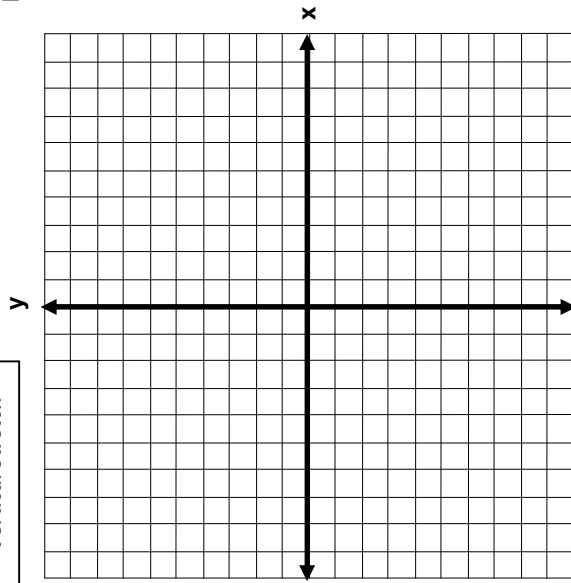
Graph each of the following functions in different colors on the graph at the right. (Sketch parent graph  $f(x) = x^2$  in pencil.)

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

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

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

Vertical Stretch

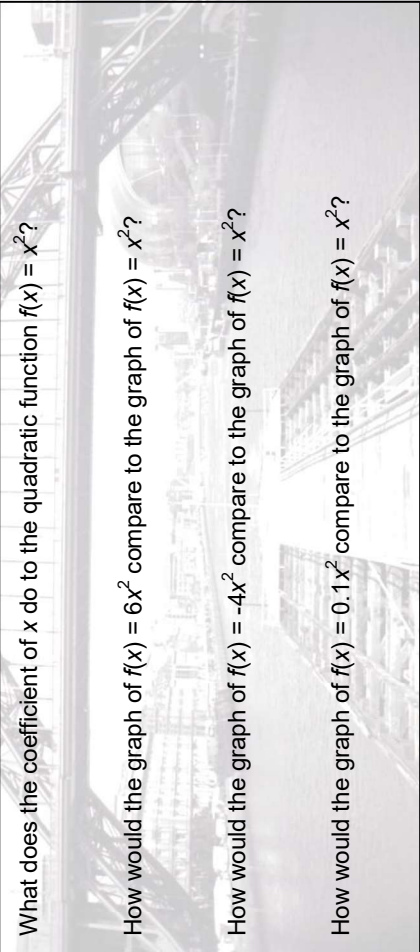


How do the transformations relate to the parent graph?

	$y = x^2 + 2$	$y = x^2 - 2$	$y = 2x^2$	$y = \frac{1}{2}x^2$	$y = -x^2$
How does the graph change?					
What are the domain and range?	D: R:	D: R:	D: R:	D: R:	D: R:
What is the end behavior?					
What is the maximum / minimum?					
Identify the intervals for which the function is increasing/ decreasing.	Inc: Dec:	Inc: Dec:	Inc: Dec:	Inc: Dec:	Inc: Dec:
What are the intercepts?	x-int: y-int:	x-int: y-int:	x-int: y-int:	x-int: y-int:	x-int: y-int:

How are the graphs alike?

How are the graphs different?



What does the coefficient of  $x$  do to the quadratic function  $f(x) = x^2$ ?

How would the graph of  $f(x) = 6x^2$  compare to the graph of  $f(x) = x^2$ ?

How would the graph of  $f(x) = -4x^2$  compare to the graph of  $f(x) = x^2$ ?

How would the graph of  $f(x) = 0.1x^2$  compare to the graph of  $f(x) = x^2$ ?

# Graphing Quadratic Functions

## Graphing Quadratic Functions In Intercept Form

Standard Form

$$f(x) = ax^2 + bx + c$$

Intercept Form

$$f(x) = a(x - b)(x - c)$$

Example

$$f(x) = 2x^2 - 4x - 6$$

Your Turn

$$f(x) = -x^2 + 6x + 1$$

Plot the x-intercepts and the vertex

$$x = \frac{-b}{2a}$$

Find and sketch axis of symmetry.

Make a table using two values higher than the x-coordinate of the vertex. Plot these points.

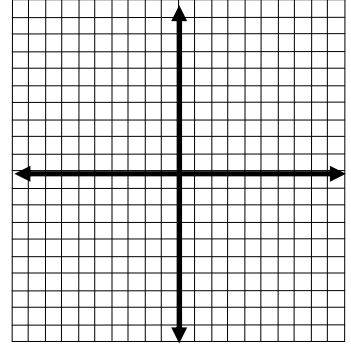
Using symmetry, find two other points on the curve and plot them.

Connect the points with a smooth curve.

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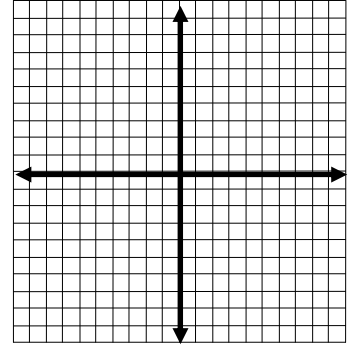
x	f(x)



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x	f(x)



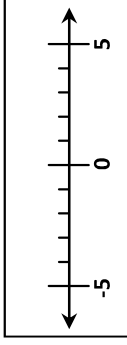
Find and plot the function's zeros

Find and sketch axis of symmetry (exact middle of zeros)

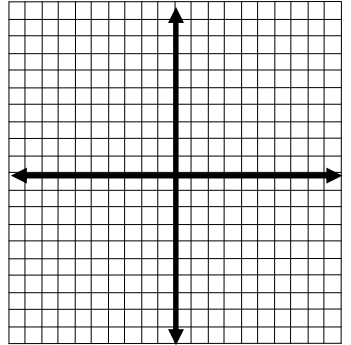
Substitute axis of symmetry for x to find the y value of the vertex.

Connect the points with a smooth curve.

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Example

$$f(x) = \frac{1}{3}(x - 2)(x + 4)$$

Your Turn

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

# Graphing Quadratic Functions In Vertex Form

Vertex Form

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

**Example**

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

**Your Turn**

$$f(x) = 2(x + 5)^2 - 4$$

Find and plot the vertex  $(h, k)$

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Find and sketch axis of symmetry.

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Make a table using two values higher than the  $x$ -coordinate of the vertex. Plot these points.

x	f(x)
_____	_____
_____	_____

Using symmetry, find 2 other points on the curve and plot them.

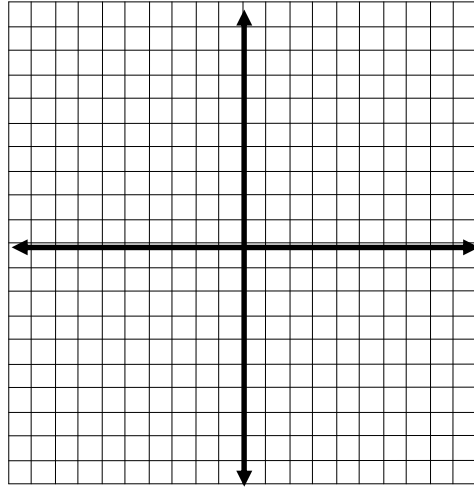
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Connect the points with a smooth curve.

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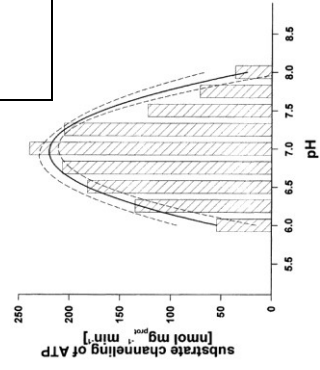
Graph and analyze the function. (This means identify its characteristics.)

$$f(x) = \frac{1}{4}(x + 2)^2 - 1$$



x-intercepts (zeros/solutions)	
y-intercept	

Domain	Range
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Intervals of Increase/Decrease	
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End Behavior	
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Max. or Min.	
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