

**Warm Up**

For each translation of the point  $(-2, 5)$ , give the coordinates of the translated point.

1. 6 units down  $(-2, -1)$

2. 3 units right  $(1, 5)$

For each function, evaluate  $f(-2)$ ,  $f(0)$ , and  $f(3)$ .

3.  $f(x) = x^2 + 2x + 6$   $6; 6; 21$

4.  $f(x) = 2x^2 - 5x + 1$   $19; 1; 4$

## *Objectives*

Transform quadratic functions.

Describe the effects of changes in the coefficients of  $y = a(x - h)^2 + k$ .

## *Vocabulary*

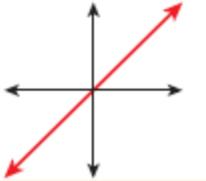
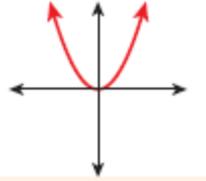
quadratic function

parabola

In Chapter 1, you studied linear functions of the form  $f(x) = mx + b$ . A **quadratic function** is a function that can be written in the form of  $f(x) = a(x - h)^2 + k$  ( $a \neq 0$ ). In a quadratic function, the variable is always squared. The table shows the linear and quadratic parent functions.

# Using Transformations to Graph Quadratic Functions

## Linear and Quadratic Parent Functions

ALGEBRA	NUMBERS	GRAPH												
<b>Linear Parent Function</b> $f(x) = x$	<table border="1"> <tr> <td><math>x</math></td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td><math>f(x) = x</math></td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> </table>	$x$	-2	-1	0	1	2	$f(x) = x$	-2	-1	0	1	2	
$x$	-2	-1	0	1	2									
$f(x) = x$	-2	-1	0	1	2									
<b>Quadratic Parent Function</b> $f(x) = x^2$	<table border="1"> <tr> <td><math>x</math></td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td><math>f(x) = x^2</math></td> <td>4</td> <td>1</td> <td>0</td> <td>1</td> <td>4</td> </tr> </table>	$x$	-2	-1	0	1	2	$f(x) = x^2$	4	1	0	1	4	
$x$	-2	-1	0	1	2									
$f(x) = x^2$	4	1	0	1	4									

Notice that the graph of the parent function  $f(x) = x^2$  is a U-shaped curve called a **parabola**. As with other functions, you can graph a quadratic function by plotting points with coordinates that make the equation true.

## Example 1: Graphing Quadratic Functions Using a Table

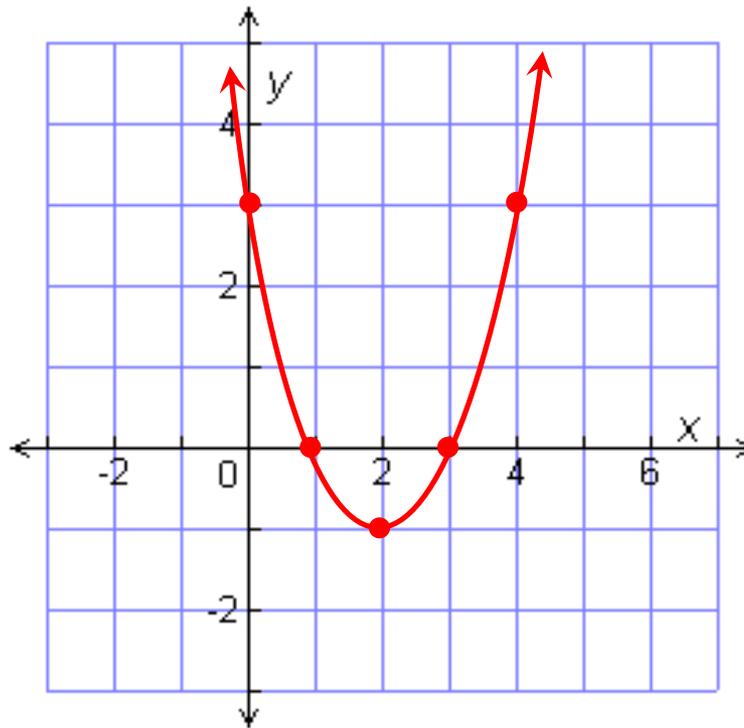
Graph  $f(x) = x^2 - 4x + 3$  by using a table.

Make a table. Plot enough ordered pairs to see both sides of the curve.

$x$	$f(x) = x^2 - 4x + 3$	$(x, f(x))$
0	$f(0) = (0)^2 - 4(0) + 3$	$(0, 3)$
1	$f(1) = (1)^2 - 4(1) + 3$	$(1, 0)$
2	$f(2) = (2)^2 - 4(2) + 3$	$(2, -1)$
3	$f(3) = (3)^2 - 4(3) + 3$	$(3, 0)$
4	$f(4) = (4)^2 - 4(4) + 3$	$(4, 3)$

## Example 1 Continued

$$f(x) = x^2 - 4x + 3$$



# Using Transformations to Graph Quadratic Functions

## Check It Out! Example 1

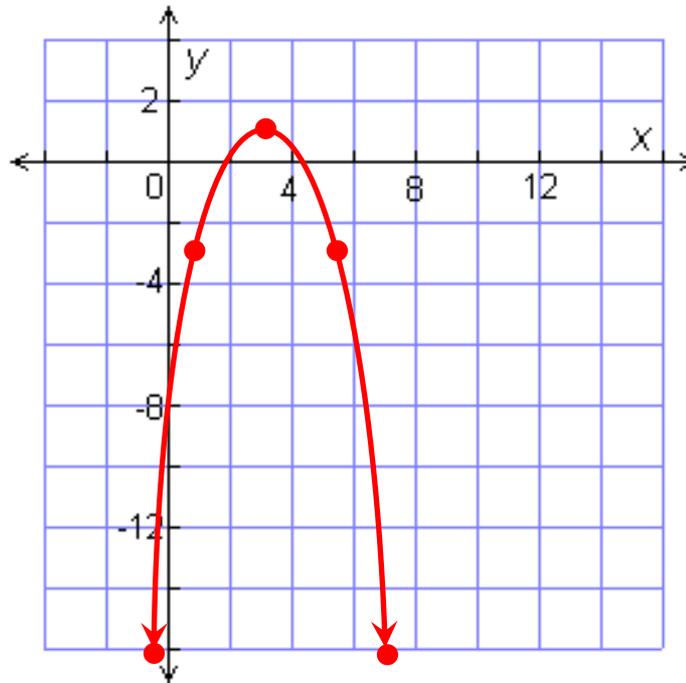
Graph  $g(x) = -x^2 + 6x - 8$  by using a table.

Make a table. Plot enough ordered pairs to see both sides of the curve.

$x$	$g(x) = -x^2 + 6x - 8$	$(x, g(x))$
-1	$g(-1) = -(-1)^2 + 6(-1) - 8$	$(-1, -15)$
1	$g(1) = -(1)^2 + 6(1) - 8$	$(1, -3)$
3	$g(3) = -(3)^2 + 6(3) - 8$	$(3, 1)$
5	$g(5) = -(5)^2 + 6(5) - 8$	$(5, -3)$
7	$g(7) = -(7)^2 + 6(7) - 8$	$(7, -15)$

## Check It Out! Example 1 Continued

$$f(x) = -x^2 + 6x - 8$$



## Lesson Quiz: Part I

1. Graph  $f(x) = x^2 + 3x - 1$  by using a table.

