

## Lesson 4.3 Math Lab: Assess Your Understanding, pages 269–271

1. Complete this table for the graph of each function.

Function	Direction of opening	Vertex	Axis of symmetry	Congruent to $y = x^2$ ?
$y = x^2$	up	(0, 0)	$x = 0$	yes
$y = (x - 7)^2$	up	(7, 0)	$x = 7$	yes
$y = (x + 8)^2$	up	(-8, 0)	$x = -8$	yes
$y = x^2 + 7$	up	(0, 7)	$x = 0$	yes
$y = x^2 - 8$	up	(0, -8)	$x = 0$	yes
$y = 7x^2$	up	(0, 0)	$x = 0$	no
$y = -7x^2$	down	(0, 0)	$x = 0$	no

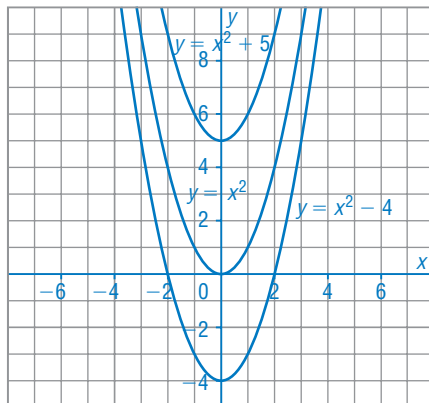
2. On grid paper, graph  $y = x^2$ . Graph each quadratic function without using a table of values or a graphing calculator.

Explain your strategy each time.

a)  $y = x^2 + 5$     $y = x^2 - 4$



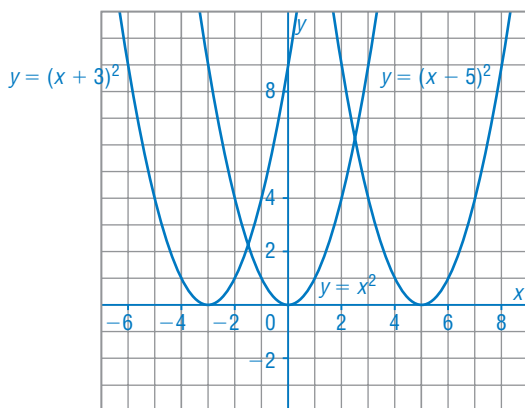
I translate the graph of  $y = x^2$  5 units up to get the graph of  $y = x^2 + 5$ . I translate the graph of  $y = x^2$  4 units down to get the graph of  $y = x^2 - 4$ .



b)  $y = (x + 3)^2$     $y = (x - 5)^2$



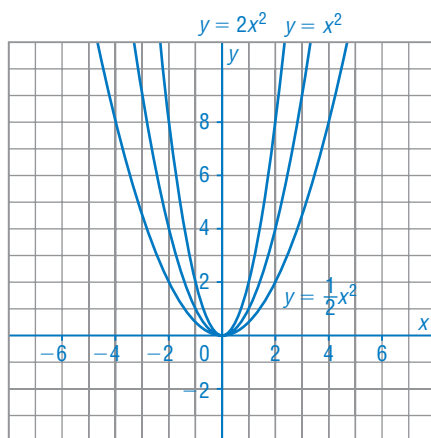
I translate the graph of  $y = x^2$  3 units left to get the graph of  $y = (x + 3)^2$ . I translate the graph of  $y = x^2$  5 units right to get the graph of  $y = (x - 5)^2$ .



c)  $y = 2x^2$     $y = \frac{1}{2}x^2$



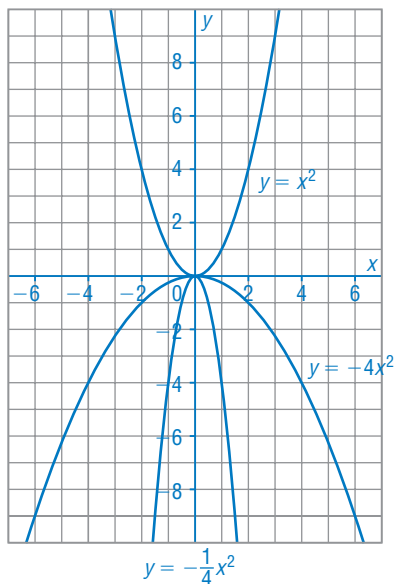
I double the y-coordinate of each point on the graph of  $y = x^2$  to get the graph of  $y = 2x^2$ . I halve the y-coordinate of each point on the graph of  $y = x^2$  to get the graph of  $y = \frac{1}{2}x^2$ .



d)  $y = -4x^2$     $y = -\frac{1}{4}x^2$



I multiply the  $y$ -coordinate of each point on the graph of  $y = x^2$  by 4, then reflect the point in the  $x$ -axis to get the graph of  $y = -4x^2$ . I divide the  $y$ -coordinate of each point on the graph of  $y = x^2$  by 4, then reflect the point in the  $x$ -axis to get the graph of  $y = -\frac{1}{4}x^2$ .



3. The graph of  $y = x^2$  is translated as described below. Without graphing, write the equation of the graph in its new position.

a) a translation of 30 units left

b) a translation of 250 units up



$y = (x + 30)^2$

$y = x^2 + 250$

c) a translation of 21 units right

d) a translation of 83 units down



$y = (x - 21)^2$

$y = x^2 - 83$

4. What happens to the axis of symmetry of the parabola in each case?

a) The graph of  $y = x^2$  is translated 5 units left.



The axis of symmetry moves 5 units left.

b) The graph of  $y = x^2$  is translated 5 units down.



The axis of symmetry does not move.