

## HOW Reminders

### • **Preparedness:**

- Be in the classroom when the bell rings
- Have something to write with, a calculator, and your notebook

### **Engagement:**

- Have your phone and computer put away

For your warm-up, take out your Big Ideas Student Journals and your calculator.



# Warm-Up

Turn to page 1 in your Big Ideas journal and do questions #1-9. You can work with someone if you'd like.

## Chapter 1

## Maintaining Mathematical Proficiency

Evaluate.

1.  $7 \cdot 3^2 + 11$

2.  $10 - 3(3 + 1)^3$

3.  $64 + 4^2 + \frac{1}{2}$

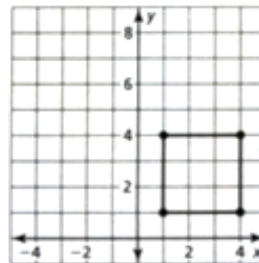
4.  $-99 + 3^2 \cdot 5$

5.  $\frac{1}{7}(7^2 + 28)$

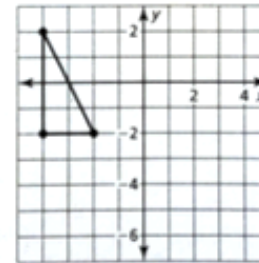
6.  $-\frac{1}{8}(8 + 24) - 2^2$

Graph the transformation of the figure.

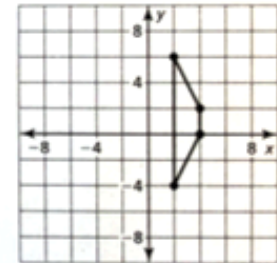
7. Translate the rectangle 3 units left and 4 units up.



8. Reflect the right triangle in the  $y$ -axis. Then translate 3 units down.



9. Translate the trapezoid 2 units up. Then reflect in the  $x$ -axis.



# 2.1 Notes

## Transformations of Quadratic Functions

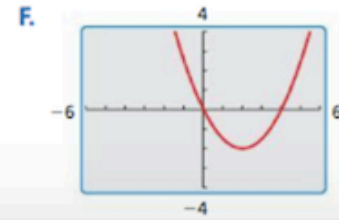
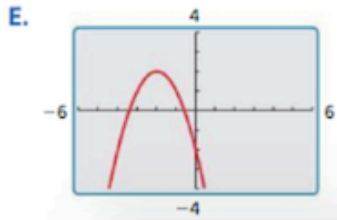
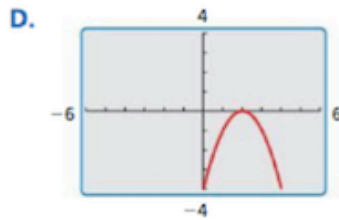
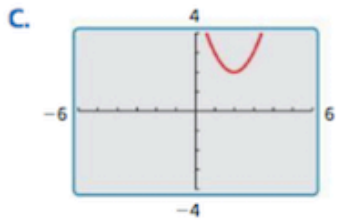
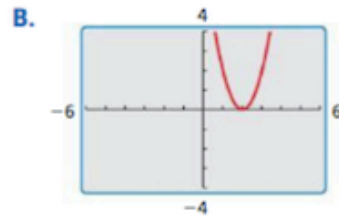
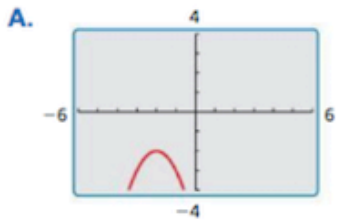
### Learning Targets:

- I can describe transformations of quadratic functions.
- I can find the vertex of a parabola, give its equation in vertex form.
- I can write the equation of a parabola in vertex form.

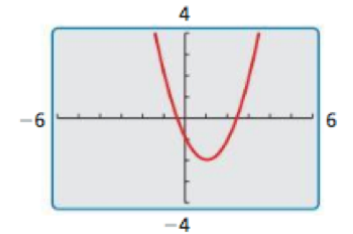
**EXPLORATION 1****Identifying Graphs of Quadratic Functions**

**Work with a partner.** Match each quadratic function with its graph. Explain your reasoning. Then use a graphing calculator to verify that your answer is correct.

- a.  $g(x) = -(x - 2)^2$       b.  $g(x) = (x - 2)^2 + 2$       c.  $g(x) = -(x + 2)^2 - 2$   
 d.  $g(x) = 0.5(x - 2)^2 - 2$       e.  $g(x) = 2(x - 2)^2$       f.  $g(x) = -(x + 2)^2 + 2$

**Student Journal: pages 24-25****Communicate Your Answer**

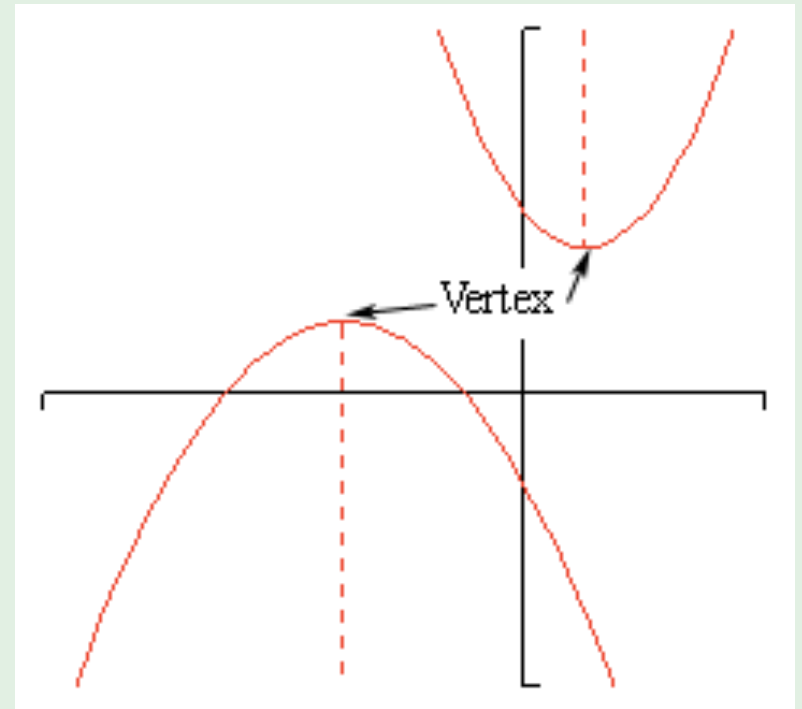
2. How do the constants  $a$ ,  $h$ , and  $k$  affect the graph of the quadratic function  $g(x) = a(x - h)^2 + k$ ?



# Vertex

The *vertex* of a parabola is its lowest/highest point.

The *axis of symmetry* of a parabola is the vertical line through the  $x$ -coordinate of its vertex



# Graph in [Desmos!](#)

**Graph each function in Desmos. Then write down the coordinate of its vertex.**

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

right 1, down 3

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

left 4, up 4

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

right 2, down 4

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

right 2, down 2

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

(4, 4)

right 4, up 4

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

(-4, -2)

left 4, down 2

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

(3, 2)

right 3, up 2

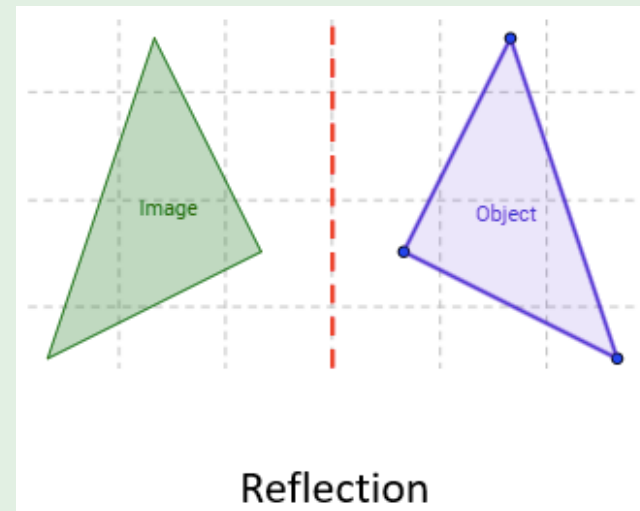
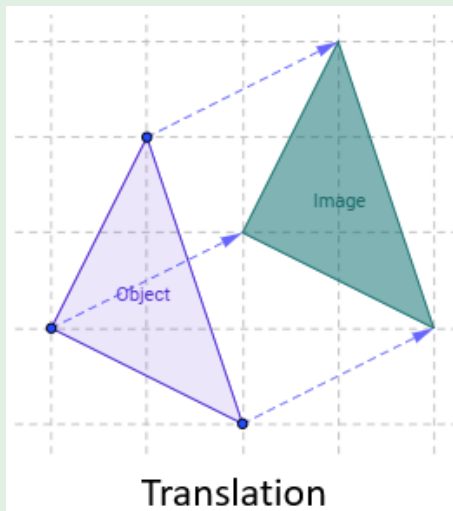
8)  $f(x) = (x + 2)^2 + 1$  (-2, 1)

left 2, up 1

A *transformation* changes the size, shape, position, or orientation of a graph.

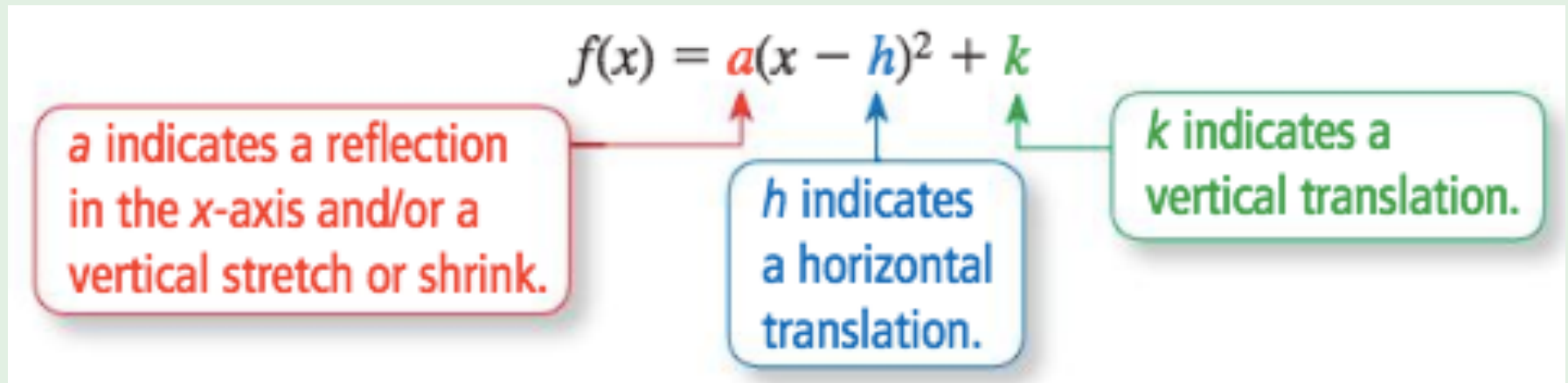
There are several different types of transformations:

- A *translation* shifts the graph horizontally or vertically. It does not change its size, shape, or orientation.
- A *reflection* flips a graph over a line. That line is called the *line of reflection*.



# Vertex Form

The vertex form of a quadratic function is:

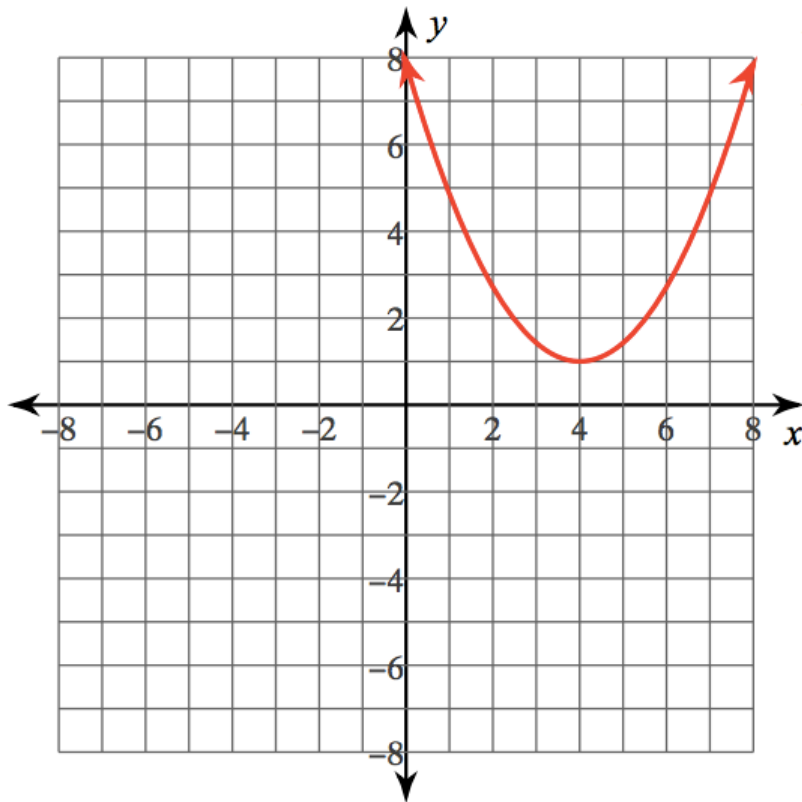


The point  $(h, k)$  is the coordinate for the vertex.



# Graphing Parabolas in Vertex Form

$$1) f(x) = \frac{3}{7}(x - 4)^2 + 1$$



Vertex: (4, 1)  
Axis of Sym.:  $x = 4$

Horizontal translation 4 units right  
Vertical translation 1 unit up

# Work with a partner

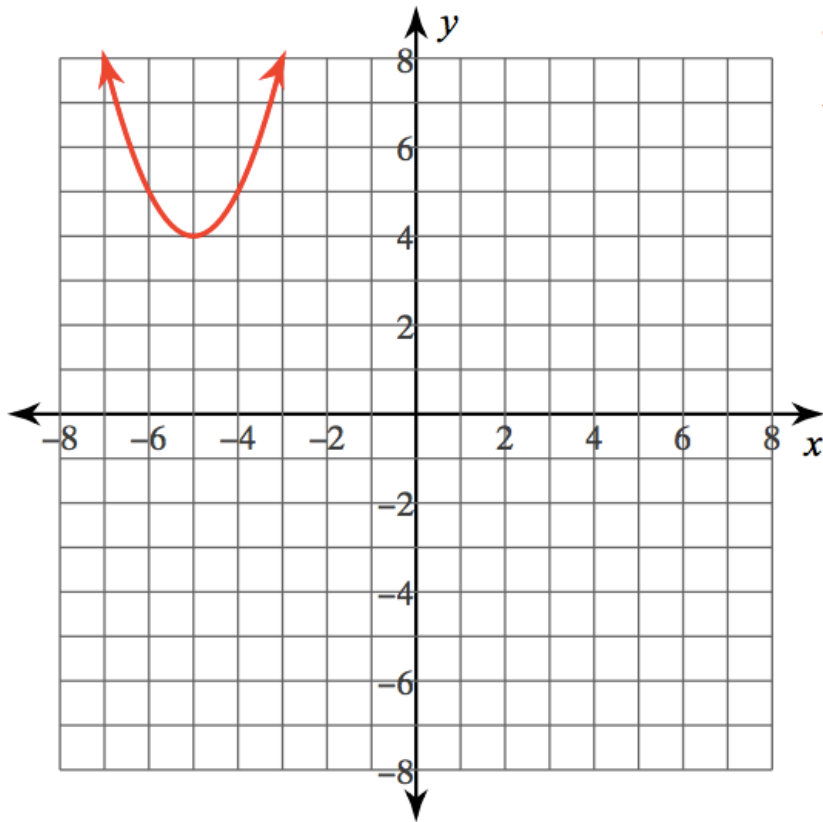
From each equation, work together to find:

- the vertex
- the opening direction
- the axis of symmetry



# Graphing Parabolas in Vertex Form

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

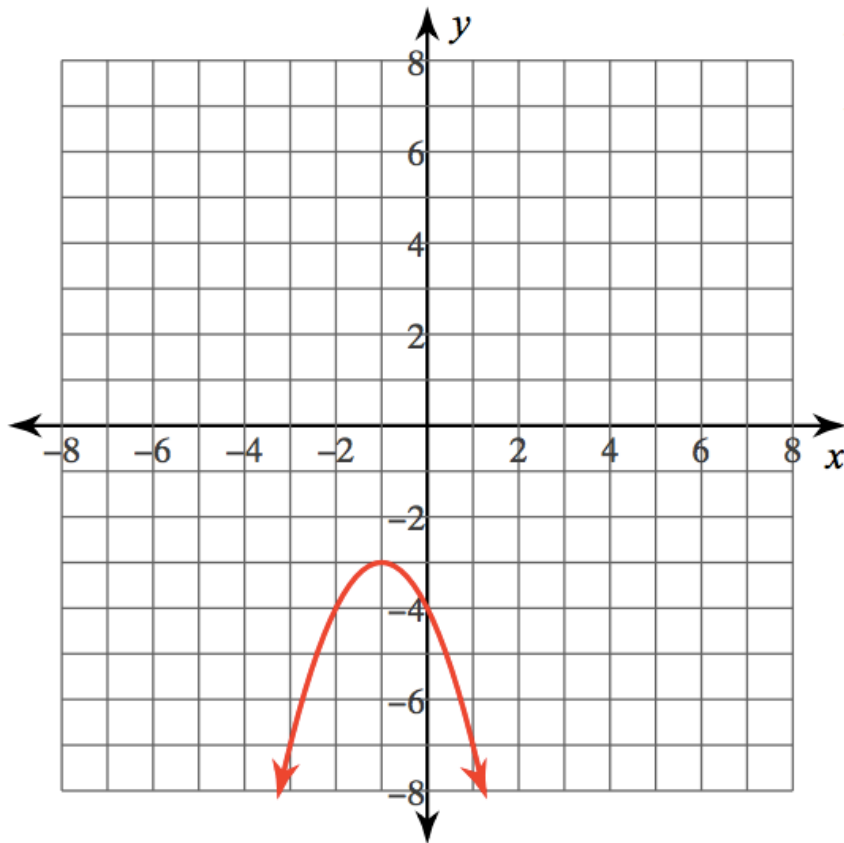


Vertex:  $(-5, 4)$   
Axis of Sym.:  $x = -5$

Horizontal translation 5 units left  
Vertical translation 4 units up

# Graphing Parabolas in Vertex Form

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

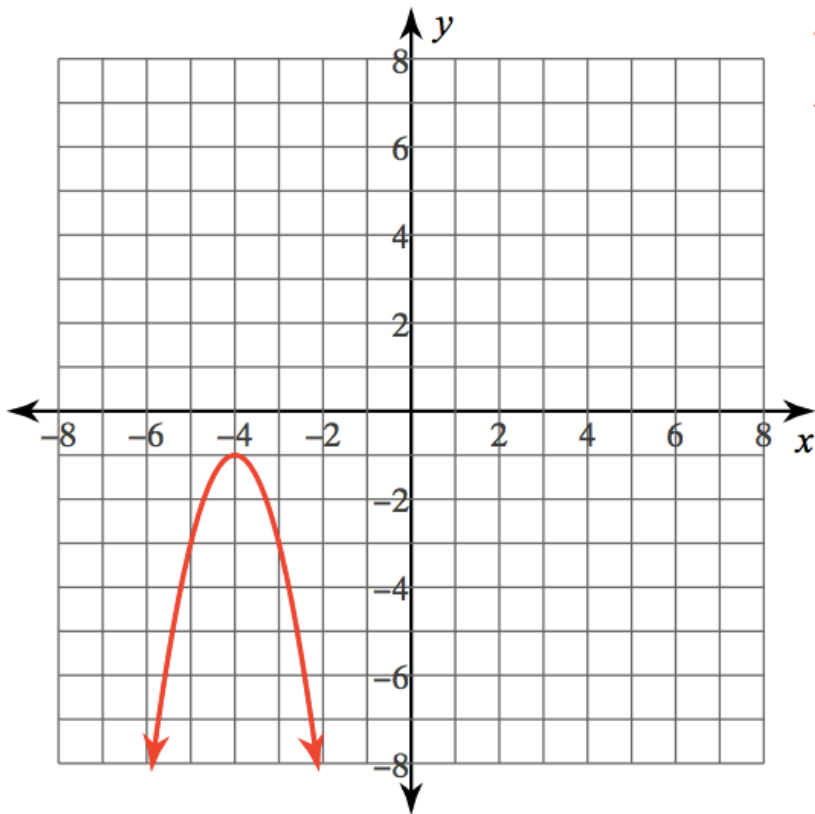


Vertex:  $(-1, -3)$   
Axis of Sym.:  $x = -1$

Horizontal translation 1 unit left  
Vertical translation 3 units down

# Graphing Parabolas in Vertex Form

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



Vertex:  $(-4, -1)$   
Axis of Sym.:  $x = -4$

Horizontal translation 4 units left  
Vertical translation 1 unit down