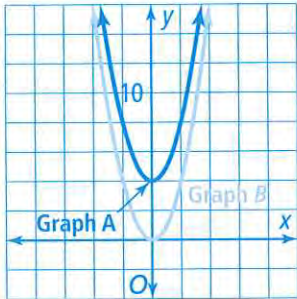


CRITIQUE & EXPLAIN

Allie states that the two graphs shown may look different, but they are actually the same figure. Esteban disagrees, stating that they are different figures because they look different.



- A. Give one mathematical argument to support Esteban's thinking.
- B. Give one mathematical argument to support Allie's thinking.
- C. **Reason** Who do you agree with? What argument can you give to justify your reasoning? © MP.2

HABITS OF MIND

Look for Relationships Think about graph A and graph B and the graphs of quadratic functions. Use what you know about graphs and think of a single change that would make the graphs different. © MP.7

EXAMPLE 1  **Try It!** Understand the Graph of $g(x) = x^2 + k$

- How does the graph of each function compare to the graph of $f(x) = x^2$?
 - $h(x) = x^2 + 3$
 - $j(x) = x^2 - 2$

EXAMPLE 2  **Try It!** Understand the Graph of $g(x) = (x - h)^2$

- How does the graph of each function compare to the graph of $f(x) = x^2$?
 - $h(x) = (x + 1)^2$
 - $j(x) = (x - 5)^2$

HABITS OF MIND

Make Sense and Persevere What are the values of h and k for a quadratic function with vertex $(1, 2)$? © MP.8

EXAMPLE 3  **Try It!** Understand the Graph of $f(x) = a(x - h)^2 + k$

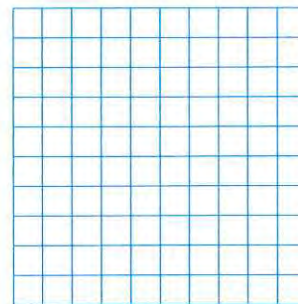
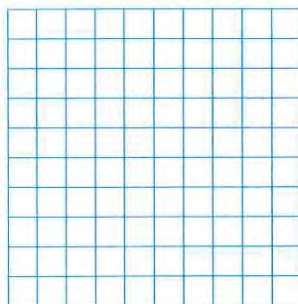
- How does the graph of $f(x) = -3(x - 5)^2 + 7$ compare to the graph of the parent function?

**EXAMPLE 4** **Try It!** Graph Using Vertex Form

4. Find the vertex and axis of symmetry, and sketch the graph of the function.

a. $g(x) = -3(x - 2)^2 + 1$

b. $h(x) = (x + 1)^2 - 4$

**HABITS OF MIND**

Construct Arguments The vertex of a parabola is in the second quadrant, and the parabola intersects the x -axis. A student says that $f(x) = -3(x + 1)^2 - 5$ could be a function for the parabola. Another student says that $f(x) = 3(x + 1)^2 + 5$ could be the function. Which student is correct? Explain. © MP.3

EXAMPLE 5 **Try It!** Use Vertex Form to Solve Problems

5. If Deshawn does not block Chris's shot, will it be a goal? Explain.

HABITS OF MIND

Reasoning Can you always write a function in vertex form for a parabola given the coordinates of the vertex and the coordinates of another point on the parabola? Explain. © MP.2

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How can the vertex form of a quadratic function help you sketch the graph of the function?

2. **Reason** A table of values for the quadratic function is shown. Do the graphs of the functions g and $f(x) = 3(x - 1)^2 + 2$ have the same axis of symmetry? Explain. © MP.2

x	$g(x)$
-4	8
-2	3
0	0
6	3

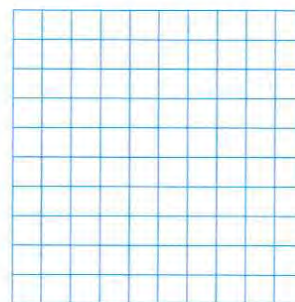
3. **Use Structure** How are the form and the graph of $f(x) = (x - h)^2 + k$ similar to the form and graph of $f(x) = |x - h| + k$? How are they different? © MP.7

4. **Error Analysis** Sarah said the vertex of the function $f(x) = (x + 2)^2 + 6$ is $(2, 6)$. Is she correct? Explain your answer. © MP.3

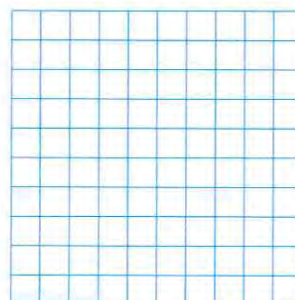
Do You KNOW HOW?

Graph each function.

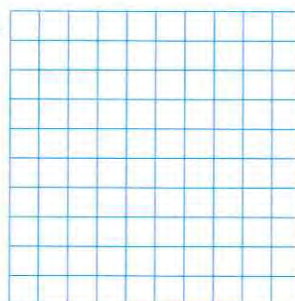
5. $g(x) = x^2 + 5$



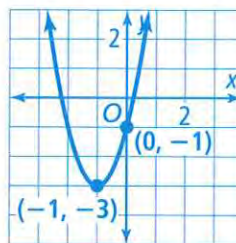
6. $f(x) = (x - 2)^2$



7. $h(x) = -2(x + 4)^2 + 1$



8. Write a function in vertex form for the parabola shown below.



9. The height of a ball thrown into the air is a quadratic function of time. The ball is thrown from a height of 6 ft above the ground. After 1 second, the ball reaches its maximum height of 22 ft above the ground. Write the equation of the function in vertex form.