

CRITIQUE & EXPLAIN

Jordan and Emery are rewriting the vertex form of the quadratic function $y = 2(x - 4)^2 + 5$ in the form $y = ax^2 + bx + c$.

Jordan

$$\begin{aligned} y &= 2(x - 4)^2 + 5 \\ &= (2x - 8)^2 + 5 \\ &= 4x^2 - 32x + 64 + 5 \\ &= 4x^2 - 32x + 69 \end{aligned}$$

Emery

$$\begin{aligned} y &= 2(x - 4)^2 + 5 \\ &= 2(x^2 - 16) + 5 \\ &= 2x^2 - 32 + 5 \\ &= 2x^2 - 27 \end{aligned}$$

- A. **Communicate Precisely** Did Jordan rewrite the equation correctly? Did Emery? Explain. © MP.6

- B. Without rewriting the equation, how could you prove that Jordan's or Emery's equation is not equivalent to the original?

HABITS OF MIND

Reason Casey rewrote the vertex form, too.

$$\begin{aligned} y &= 2(x - 4)^2 + 5 \\ &= 2(x + 1)^2 \\ &= 2(x^2 + 2x + 1) \\ &= 2x^2 + 4x + 2 \end{aligned}$$

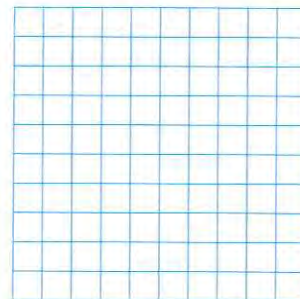
Is Casey correct? Explain. © MP.2

**EXAMPLE 1** **Try It! Find the Vertex of a Quadratic Function in Standard Form**

1. What is the vertex of the graph of the function $f(x) = x^2 - 8x + 5$?

EXAMPLE 2 **Try It! Graph a Quadratic Function in Standard Form**

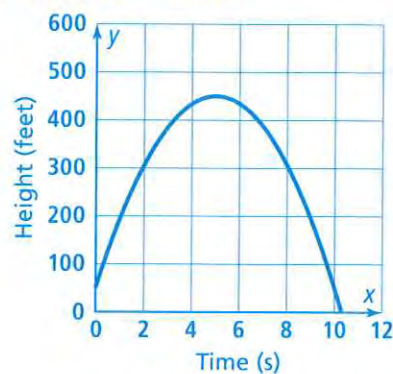
2. Use key features to graph the function $f(x) = x^2 - 6x - 1$.

**HABITS OF MIND**

Error Analysis Yuson said that for the quadratic function $f(x) = 2x^2 + 3x + 1$, the vertex is at the point $(0, 1)$. Is she correct? Explain. © MP.3

EXAMPLE 3 **Try It! Interpret the Graph of a Quadratic Function**

3. A water balloon was thrown from a window. The height of the water balloon over time can be modeled by the function $y = -16x^2 + 160x + 50$. What was the maximum height of the water balloon after it was thrown?

**HABITS OF MIND**

Make Sense and Persevere How long did it take for the water balloon to reach its maximum height? © MP.1

**EXAMPLE 4** **Try It!** Write the Equation of a Parabola Given Three Points

4. What is the equation of a parabola that passes through the points $(2, -12)$, $(-1, -15)$, and $(-4, -90)$?

EXAMPLE 5 **Try It!** Use Quadratic Regression

5. A fan threw a souvenir football into the air from the top of the bleachers toward the bottom of the bleachers. The table shows the height of the football, in feet, above the ground at various times, in seconds. If the football wasn't touched by anyone on its way to the ground, about how long did it take the football to reach the ground after it was thrown?

Time (s)	0	0.2	0.4	0.6	0.8	1.0
Height (ft)	10	11.76	12.24	11.44	9.36	6.0

HABITS OF MIND

Model With Mathematics How many points does it take to determine the equation of a quadratic function? Why are so many more points used in Example 4? © MP.4

