

# 4.10 Write Quadratic Functions and Models

TEKS 2A.1.B, 2A.6.B,  
2A.6.C, 2A.8.A



**Before**

You wrote linear functions and models.

**Now**

You will write quadratic functions and models.

**Why?**

So you can model the cross section of parabolic dishes, as in Ex. 46.

## Key Vocabulary

- best-fitting quadratic model

In Lessons 4.1 and 4.2, you learned how to graph quadratic functions. In this lesson, you will write quadratic functions given information about their graphs.

### EXAMPLE 1 Write a quadratic function in vertex form

Write a quadratic function for the parabola shown.

#### Solution

Use vertex form because the vertex is given.

$$y = a(x - h)^2 + k \quad \text{Vertex form}$$

$$y = a(x - 1)^2 - 2 \quad \text{Substitute 1 for } h \text{ and } -2 \text{ for } k.$$

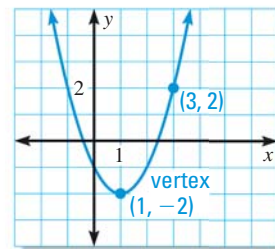
Use the other given point, (3, 2), to find  $a$ .

$$2 = a(3 - 1)^2 - 2 \quad \text{Substitute 3 for } x \text{ and 2 for } y.$$

$$2 = 4a - 2 \quad \text{Simplify coefficient of } a.$$

$$1 = a \quad \text{Solve for } a.$$

▶ A quadratic function for the parabola is  $y = (x - 1)^2 - 2$ .



### EXAMPLE 2 Write a quadratic function in intercept form

Write a quadratic function for the parabola shown.

#### Solution

Use intercept form because the  $x$ -intercepts are given.

$$y = a(x - p)(x - q) \quad \text{Intercept form}$$

$$y = a(x + 1)(x - 4) \quad \text{Substitute } -1 \text{ for } p \text{ and } 4 \text{ for } q.$$

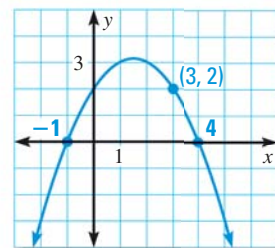
Use the other given point, (3, 2), to find  $a$ .

$$2 = a(3 + 1)(3 - 4) \quad \text{Substitute 3 for } x \text{ and 2 for } y.$$

$$2 = -4a \quad \text{Simplify coefficient of } a.$$

$$-\frac{1}{2} = a \quad \text{Solve for } a.$$

▶ A quadratic function for the parabola is  $y = -\frac{1}{2}(x + 1)(x - 4)$ .



#### AVOID ERRORS

Be sure to substitute the  $x$ -intercepts and the coordinates of the given point for the correct letters in  $y = a(x - p)(x - q)$ .