

Exercise 49

For the following exercises, use the vertex (h, k) and a point on the graph (x, y) to find the general form of the equation of the quadratic function.

$$(h, k) = (-5, 3), (x, y) = (2, 9)$$

Solution

Start with the vertex form of a general quadratic function.

$$y = a(x - h)^2 + k$$

The vertex $(-5, 3)$ is given, so h and k are known.

$$\begin{aligned}y &= a(x - (-5))^2 + 3 \\ &= a(x + 5)^2 + 3\end{aligned}$$

Now use the fact that $y = 9$ when $x = 2$ to determine a .

$$9 = a(2 + 5)^2 + 3$$

$$6 = a(49)$$

$$a = \frac{6}{49}$$

Therefore, the quadratic function is

$$\begin{aligned}y &= \frac{6}{49}(x + 5)^2 + 3 \\ &= \frac{6}{49}(x^2 + 10x + 25) + 3 \\ &= \left(\frac{6}{49}x^2 + \frac{60}{49}x + \frac{150}{49} \right) + 3 \\ &= \frac{6}{49}x^2 + \frac{60}{49}x + \frac{297}{49}.\end{aligned}$$

A graph of it is shown below.

