

Exercise 46

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.

$$(h, k) = (-2, -1), (x, y) = (-4, 3)$$

Solution

Start with the vertex form of a general quadratic function.

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

The vertex $(-2, -1)$ is given, so h and k are known.

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

Now use the fact that $y = 3$ when $x = -4$ to determine a .

$$\begin{aligned} 3 &= a(-4 + 2)^2 - 1 \\ 3 &= a(-2)^2 - 1 \\ 4 &= a(4) \\ a &= 1 \end{aligned}$$

Therefore, the quadratic function is

$$\begin{aligned} y &= 1(x + 2)^2 - 1 \\ &= (x + 2)^2 - 1 \\ &= (x^2 + 4x + 4) - 1 \\ &= x^2 + 4x + 3. \end{aligned}$$

