Exercise 50

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.

$$(h, k) = (3, 2),\ (x, y) = (10, 1)$$

Solution

Start with the vertex form of a general quadratic function.

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

The vertex $(3, 2)$ is given, so h and k are known.

$$y = a(x - 3)^2 + 2$$

Now use the fact that $y = 1$ when $x = 10$ to determine a.

$$1 = a(10 - 3)^2 + 2$$

$$-1 = a(49)$$

$$a = -\frac{1}{49}$$

Therefore, the quadratic function is

$$\begin{aligned} y &= -\frac{1}{49}(x - 3)^2 + 2 \\ &= -\frac{1}{49}(x^2 - 6x + 9) + 2 \\ &= \left(-\frac{1}{49}x^2 + \frac{6}{49}x - \frac{9}{49}\right) + 2 \\ &= -\frac{1}{49}x^2 + \frac{6}{49}x + \frac{89}{49}. \end{aligned}$$

A graph of it is shown below.