Exercise 48

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.

$$(h, k) = (2, 3),\ (x, y) = (5, 12)$$

Solution

Start with the vertex form of a general quadratic function.

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

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

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

Now use the fact that $y = 12$ when $x = 5$ to determine a.

$$12 = a(5 - 2)^2 + 3$$

$$9 = a(9)$$

$$a = 1$$

Therefore, the quadratic function is

$$\begin{aligned} y &= 1(x - 2)^2 + 3 \\ &= (x - 2)^2 + 3 \\ &= (x^2 - 4x + 4) + 3 \\ &= x^2 - 4x + 7. \end{aligned}$$