Exercise 82

For the following exercises, write the equation of the quadratic function that contains the given point and has the same shape as the given function.

Contains $(1, -3)$ and has the shape of $f(x) = -x^2$. Vertex is on the y-axis.

Solution

Start with the general vertex form of a quadratic function.

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

The function has the shape of $-x^2$, so $a = -1$.

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

The vertex is on the y-axis, so $h = 0$.

$$y = -x^2 + k$$

Now use the fact that $y = -3$ when $x = 1$ to determine k.

$$-3 = -(1)^2 + k$$

$$-3 = -(1) + k$$

$$-3 = -1 + k$$

$$k = -2$$

Therefore, the quadratic function is

$$y = -x^2 - 2.$$