Exercise 84

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 $(1, -6)$ has the shape of $f(x) = 3x^2$. Vertex has x-coordinate of -1.

[TYPO: This should be "and has."]

Solution

Start with the general vertex form of a quadratic function.

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

The function has the shape of $3x^2$, so $a = 3$.

$$y = 3(x - h)^2 + k$$

The vertex has an x-coordinate of -1, so $h = -1$.

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

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

Now use the fact that $y = -6$ when $x = 1$ to determine k.

$$-6 = 3(1 + 1)^2 + k$$

$$-6 = 3(4) + k$$

$$-6 = 12 + k$$

$$k = -18$$

Therefore, the quadratic function is

$$y = 3(x + 1)^2 - 18.$$