

Exercise 66

For the following exercises, use the table of values that represent points on the graph of a quadratic function. By determining the vertex and axis of symmetry, find the general form of the equation of the quadratic function.

| | | | | | |
|-----|----|----|---|---|---|
| x | -2 | -1 | 0 | 1 | 2 |
| y | 1 | 0 | 1 | 4 | 9 |

Solution

Notice that the y -values are the same for $x = -2, 0$. This means the axis of symmetry is $x = -1$. Start with the general formula of a quadratic function in vertex form.

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

The y -value corresponding to $x = -1$ is 0, so the vertex is $(-1, 0)$, which means $h = -1$ and $k = 0$.

$$\begin{aligned}y &= a(x - (-1))^2 + 0 \\ &= a(x + 1)^2\end{aligned}$$

Use any of the other points to determine a . For example, $y = 1$ when $x = 0$.

$$\begin{aligned}1 &= a(0 + 1)^2 \\ 1 &= a(1) \\ a &= 1\end{aligned}$$

Therefore, the quadratic function is

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