

Exercise 67

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	-2	1	2	1	-2

Solution

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

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

The y -value corresponding to $x = 0$ is 2, so the vertex is $(0, 2)$, which means $h = 0$ and $k = 2$.

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

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

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

Therefore, the quadratic function is

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