

Exercise 68

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	-8	-3	0	1	0

Solution

Notice that the y -values are the same for $x = 0, 2$. 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 1, so the vertex is $(1, 1)$, which means $h = 1$ and $k = 1$.

$$y = a(x - 1)^2 + 1$$

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

$$0 = a(0 - 1)^2 + 1$$

$$-1 = a(1)$$

$$a = -1$$

Therefore, the quadratic function is

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