

Introduction to Graphing Piecewise Functions

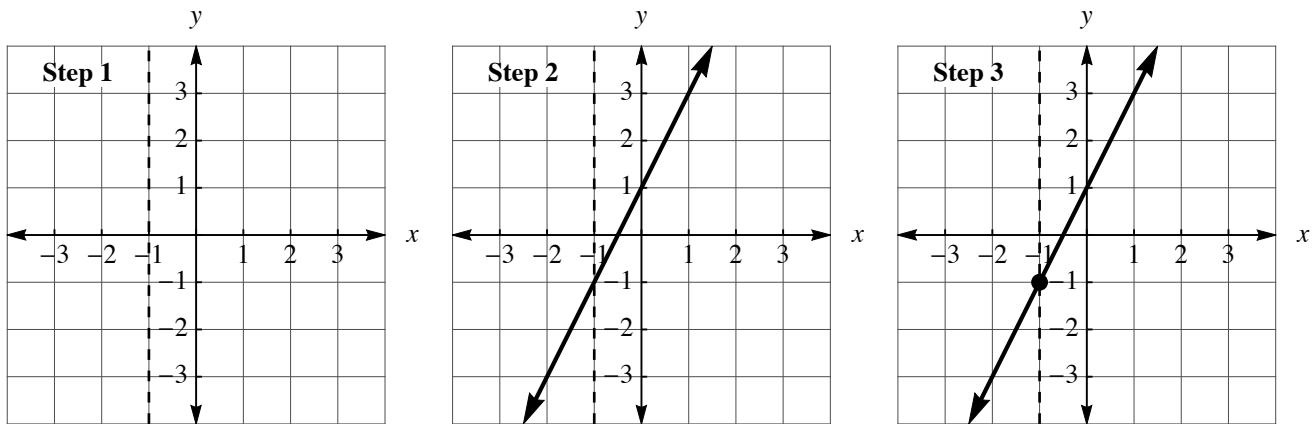
Graphing a piecewise function is essentially just graphing each of its pieces; in other words, we take the piecewise function apart and graph each part. Let's illustrate the steps with an example:

$$f(x) = \begin{cases} 2x + 1 & x \leq -1 \\ -x + 2 & x > -1 \end{cases}$$

This piecewise function has two parts. One part lies to the left of $x = -1$ and the other part lies to the right of $x = -1$.

Step 1: Draw the "Fence"

The first step is to draw a vertical through the point on the x -axis that divides the two regions. This line is called the "fence" because it is like a fence that divides two neighbors.



Step 2: Graph the First Function

When the function is a ray or line segment, it can be helpful to think of the function as a line and then graph that line, as shown above.

Step 3: Find the Point on the Fence

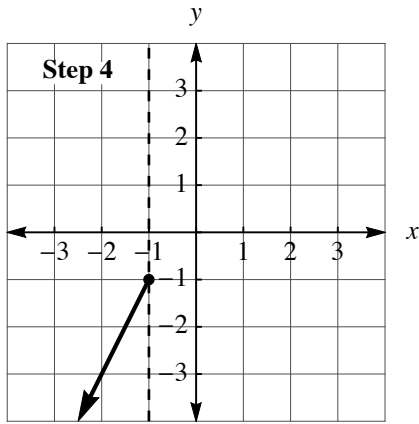
For the first function, the y -coordinate for the point on the fence (which is where $x = -1$), is

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

In this case, the function "owns" the fence because its condition for the x -values has the equal ($=$) sign. This point is therefore a closed circle, and is shown on the graph above.

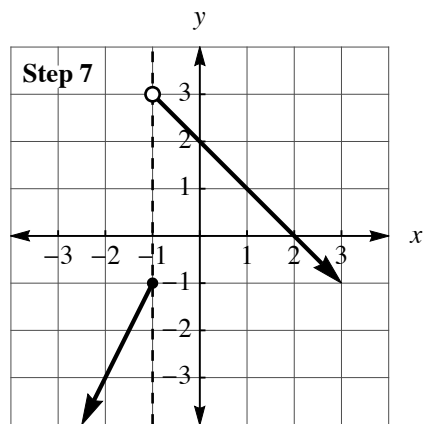
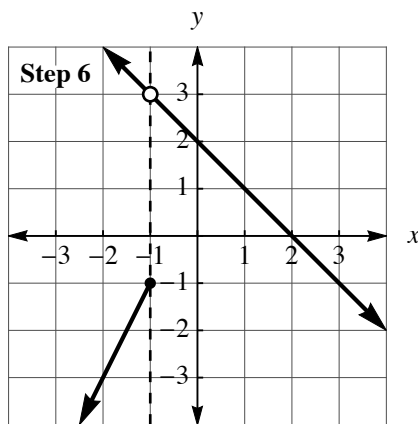
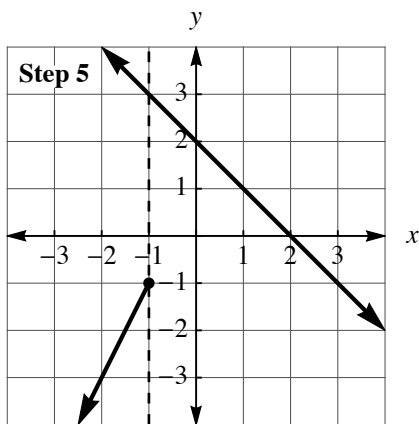
Step 4: Clean Up

The last step is to cross out or erase the part of the line that is on the wrong side of the fence. In this case, all the x values are less than or equal to -1 ($x \leq -1$), so this function "lives" on the left side of the fence:



Step 5: Repeat the Graphing for the Second Function

The line associate with the second ray is shown graphed below.



Step 6: Find the Point on the Fence

For the first function, the y-coordinate for the point on the fence (which is where $x = -1$), is

$$y = -x + 2$$

$$y = -(-1) + 2$$

$$y = 1 + 1$$

$$y = 3$$

In this case, the function does not “own” the fence because its condition for the x -values does not have the equal (=) sign. This point is therefore an open circle, and is shown on the graph above.

Step 7: Clean Up

The last step is to cross out or erase the part of the line that is on the wrong side of the fence. In this case, all the x values are greater than -1 ($x > -1$), so this function “lives” on the right side of the fence, as shown above.