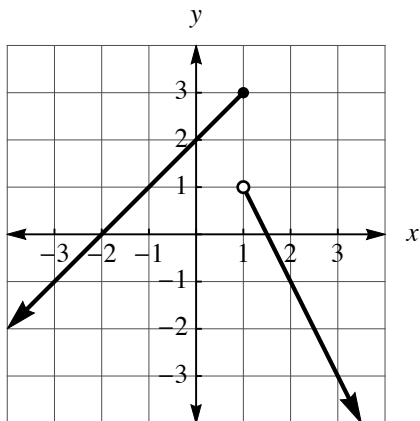


## Introduction to Obtaining Piecewise Function Equations

Obtaining the equation of a piecewise function is very similar to finding the equation of a line, ray, line segment, or any other function. The main difference is that there is more than one function graphed so you have to find the equation for each. Let's illustrate the steps with an example:



Since this piecewise function is made up of two rays, we just have to find the equation of each ray (see the previous notes if you are unsure how to do that).

### Ray 1: Step 1

Find the equation of the corresponding line.

From the graph, the  $y$ -intercept is 2, so  $b = 2$ . Also from the graph, the slope of the line is

$$m = \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{1}{1} = 1$$

Using the slope-intercept form of the equation of the line, we can get its equation:

$$y = mx + b$$

$$y = x + 2$$

### Ray 1: Step 2

Find the inequality that describes the valid  $x$ -values. The valid  $x$  values are all values less than or equal to 1. We can write this as:

$$x \leq 1$$

### Ray 1: Step 3

Put the equation and inequality together into a single statement:

$$y = x + 2 \text{ and } x \leq 1$$

We now do the same steps for the second ray.

### Ray 2: Step 1

Find the equation of the corresponding line.

From the graph, the  $y$ -intercept is 2, so  $b = 2$ . Also from the graph, the slope of the line is

$$m = \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-2}{1} = -2$$

Using the slope-intercept form of the equation of the line, we can get its equation:

$$y = mx + b$$
$$y = -2x + 2$$

**Ray 2: Step 2**

Find the inequality that describes the valid  $x$ -values. The valid  $x$  values are all values great than (but not equal to!) 1. We can write this as:

$$x > 1$$

**Ray 2: Step 3**

Put the equation and inequality together into a single statement:

$$y = -2x + 2 \text{ and } x > 1$$

**Final Step: Combine the Equations**

We can now combine these two equations together to form a piecewise function:

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