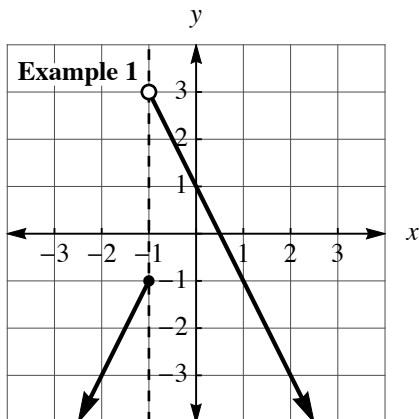


Obtaining Piecewise Equations: More Examples

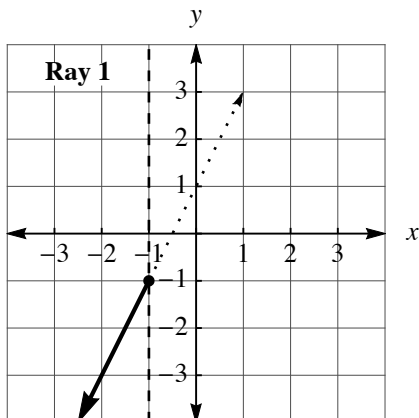
Example 1

Find the function for the following piecewise function:



Ray 1: Step 1

Find the equation of the corresponding line (by extending the line so we can see the y-intercept):



From the graph, the y-intercept is 1, so $b = 1$. 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:

$$\begin{aligned} y &= mx + b \\ y &= 2x + 1 \end{aligned}$$

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:

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

We now do the same steps for the second ray.

Ray 2: Step 1

Find the equation of the corresponding line.

From the first graph, the y-intercept is 1, so $b = 1$. 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:

$$y = mx + b$$
$$y = -2x + 1$$

Ray 2: Step 2

Find the inequality that describes the valid x-values. The valid x values are all values greater 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:

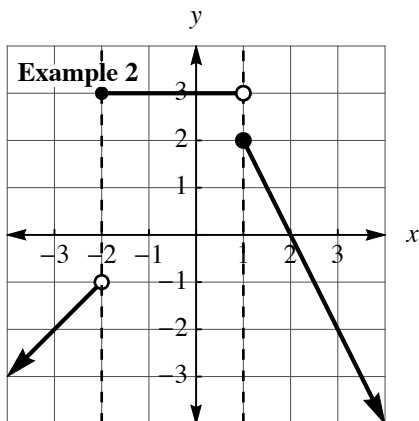
$$y = -2x + 2 \text{ and } x > 1$$

Final Step: Combine the Equations

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

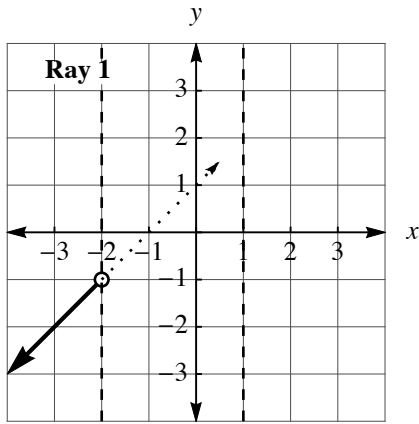
$$f(x) = \begin{cases} 2x + 1 & x \leq -1 \\ -2x + 1 & x > -1 \end{cases}$$

Example 2



Ray 1: Step 1

Find the equation of the corresponding line (by extending the line so we can see the y-intercept):



From the graph, the y-intercept is 1, so $b = 1$. 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:

$$y = mx + b$$

$$y = x + 1$$

Ray 1: Step 2

Find the inequality that describes the valid x -values. The valid x values are all values less than -2 . We can write this as:

$$x < -2$$

Ray 1: Step 3

Put the equation and inequality together into a single statement:

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

We now do the same steps for the line segment and the second ray.

Line Segment 1: Step 1

Find the equation of the corresponding line.

From the graph, the y-intercept is 3 so $b = 3$. Also from the graph, the slope of the line is zero so $m = 0$.

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

$$y = mx + b$$

$$y = 3$$

Line Segment 1: Step 2

Find the inequality that describes the valid x -values. The valid x values are all values greater than or equal to -2 and less than 1. We can write this as:

$$x \geq -2 \text{ and } x < 1 \text{ or } -2 \leq x < 1$$

Line Segment 1: Step 3

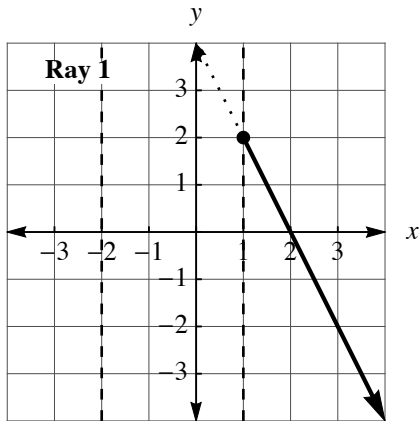
Put the equation and inequality together into a single statement:

$$y = 3 \text{ and } -2 \leq x < 1$$

We now do the same steps for the second ray.

Ray 2: Step 1

Find the equation of the corresponding line (by extending the line so we can see the y-intercept):



From the graph, the y-intercept is 4, so $b = 4$. 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:

$$y = mx + b$$
$$y = -2x + 4$$

Ray 1: Step 2

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

$$x \geq 1$$

Ray 1: Step 3

Put the equation and inequality together into a single statement:

$$y = -2x + 4 \text{ and } x \geq 1$$

We now do the same steps for the line segment and the second ray.

Final Step: Combine the Equations

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

$$f(x) = \begin{cases} x + 1 & x < -2 \\ 3 & -2 \leq x < 1 \\ -2x + 4 & x \geq 1 \end{cases}$$