

Graph Piecewise Functions

by Sophia



WHAT'S COVERED

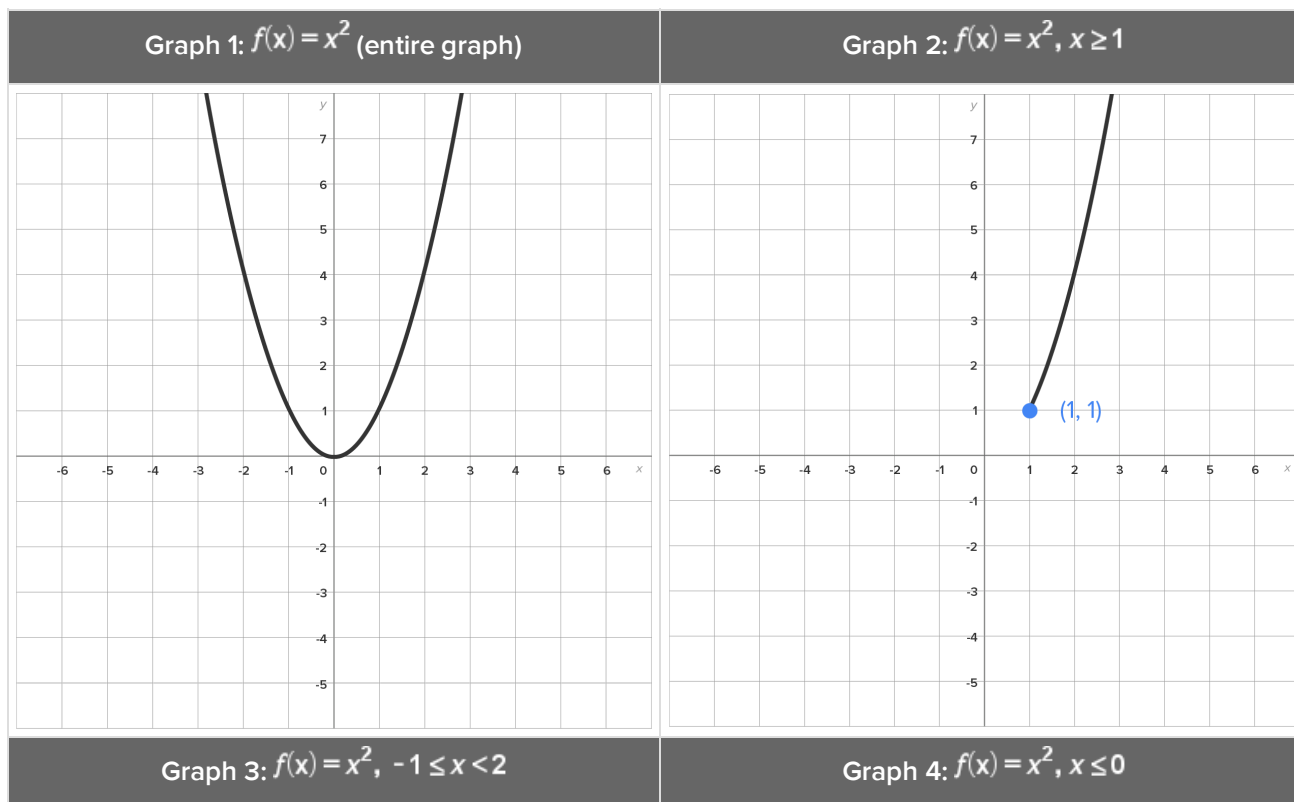
In this lesson, you will graph piecewise functions. Specifically, this lesson will cover:

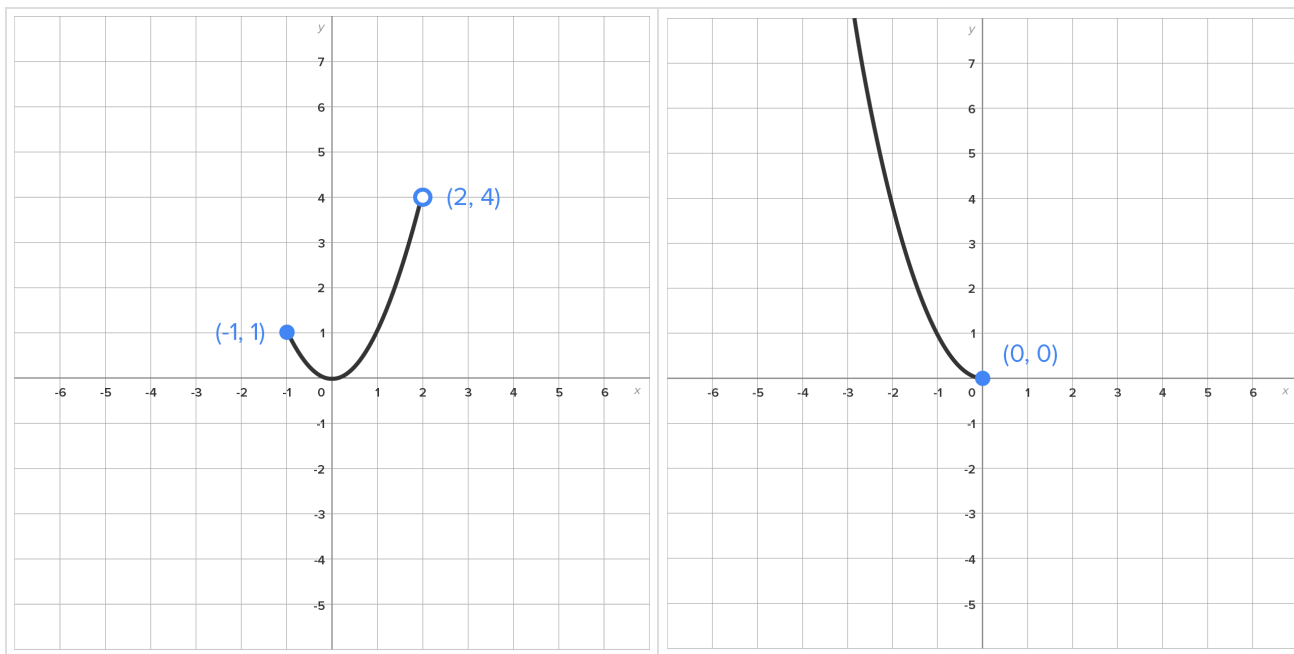
1. Graphing a Function on a Restricted Domain
2. Graphing Piecewise Functions

1. Graphing a Function on a Restricted Domain

When we graph a function, we are considering the entire function. What if we only wanted part of the graph?

⇒ **EXAMPLE** For example, consider the function $f(x) = x^2$, and several “pieces” of the graph, as shown below:





To sketch a portion of the graph, a **restricted domain** is used. Recall that the domain of a function is the set of all possible inputs for a function.

For example, in Graph 3 above, the “ $-1 \leq x < 2$ ” is the domain restriction since it is not the entire domain of $f(x) = x^2$ (which is all real numbers).



When an endpoint is included, we represent it by using a closed circle. See Graphs 2, 3, and 4.

When an endpoint is not included, we represent it by using an open circle. See Graph 3.

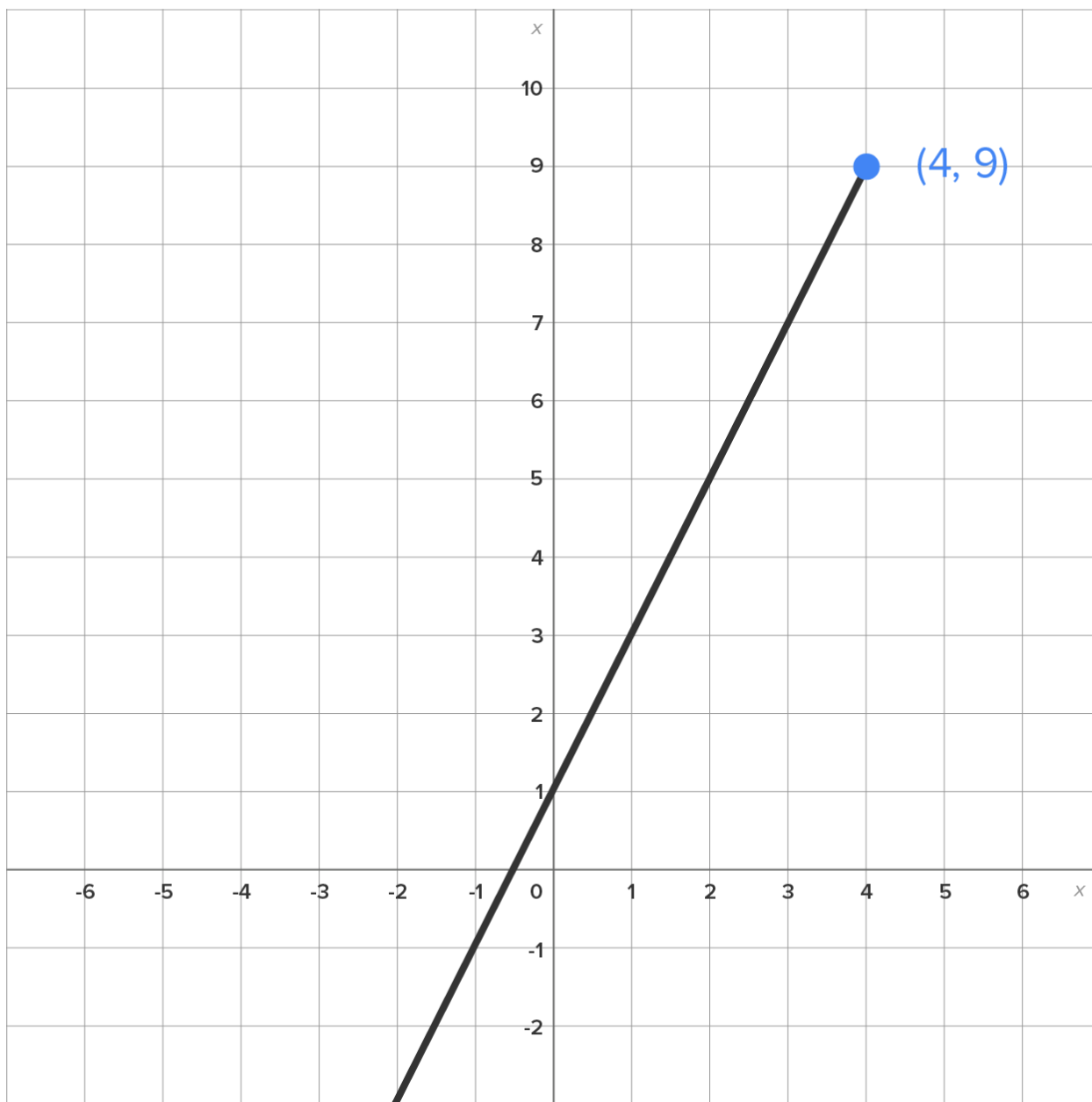


Consider the following function: $f(x) = 2x + 1, x \leq 4$.

Graph this function.



Remembering that $y = 2x + 1$ is a line with slope 2 and y-intercept 1, we graph the line but only for values of x up to and including 4.



TERM TO KNOW

Restricted Domain

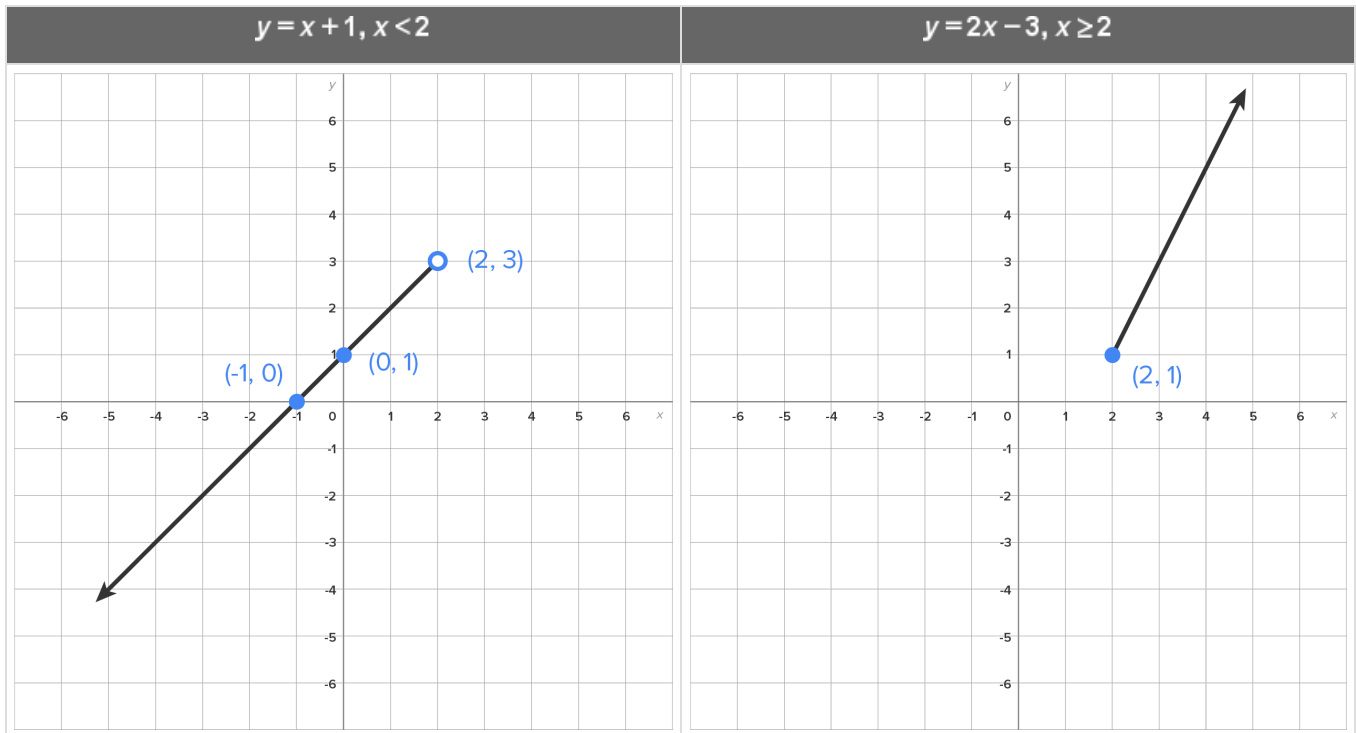
Part of, but not the entire, domain of a function.

2. Graphing Piecewise Functions

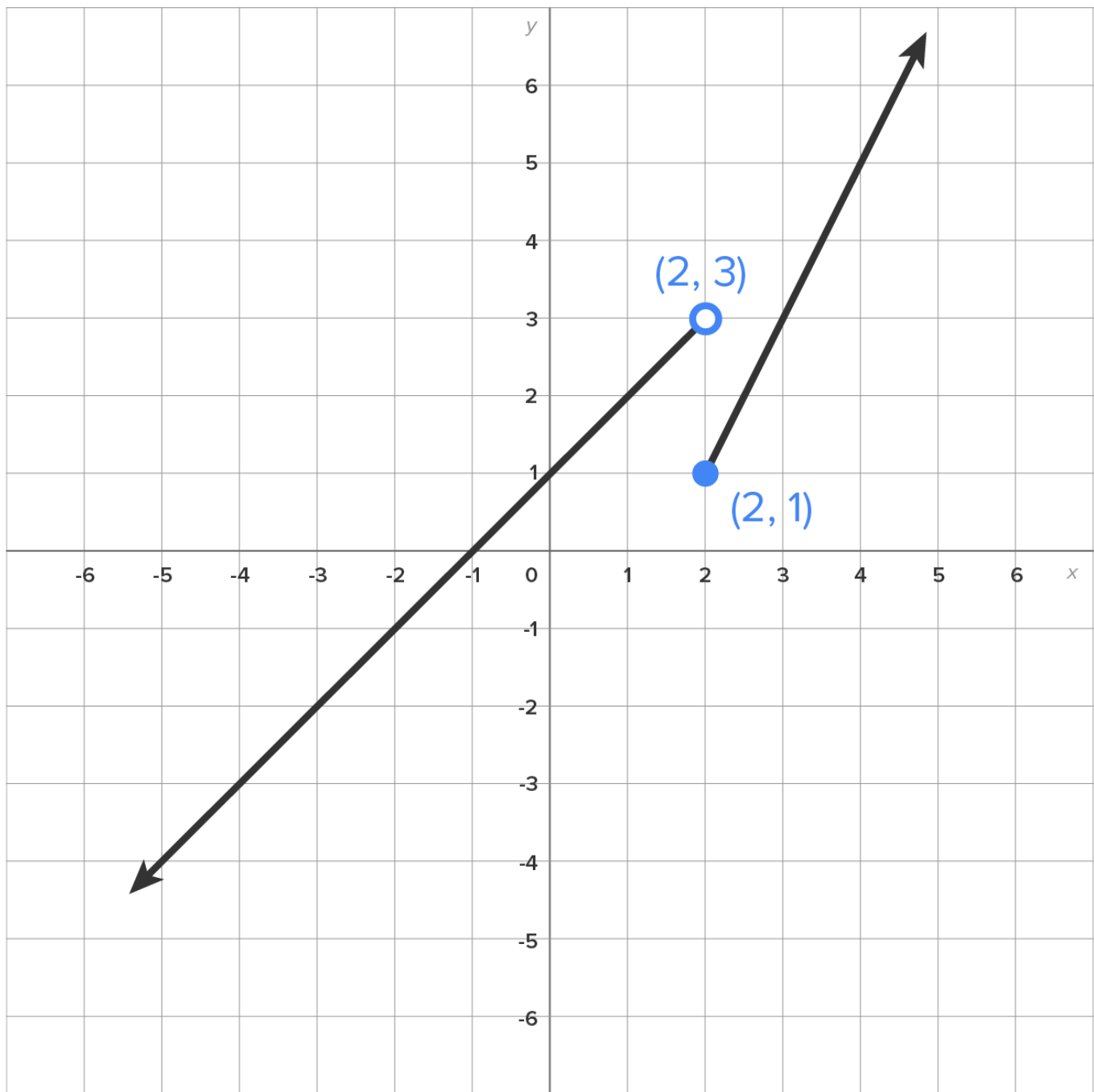
A piecewise function is made up of other functions that are on restricted domains. For example, consider the function:

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

The function tells us to use “ $x + 1$ ”, but only if the input is less than 2; and to use “ $2x - 3$ ” if the input is at least 2. This means that the graph of the function will be “part of” the graph of $y = x + 1$ along with “part of” the graph of $2x - 3$. Here is how we put this together:



The graph of $f(x)$ is these pieces put together on one graph as follows:



The following video walks you through the process of graphing a piecewise function.

SUMMARY

In this lesson, you recalled that when you graph a function, you consider the entire function. However, if you only want part of the graph, you learned how to **graph a function on a restricted domain**, which is part of, but not the entire, domain of a function. You learned how to apply this knowledge to **graphing**

piecewise functions—which are made up of other functions that are on restricted domains—which requires you to graph each piece on their respective restricted domains of the function.

SOURCE: THIS WORK IS ADAPTED FROM CHAPTER 0 OF *CONTEMPORARY CALCULUS* BY DALE HOFFMAN.



TERMS TO KNOW

Restricted Domain

Part of, but not the entire, domain of a function.