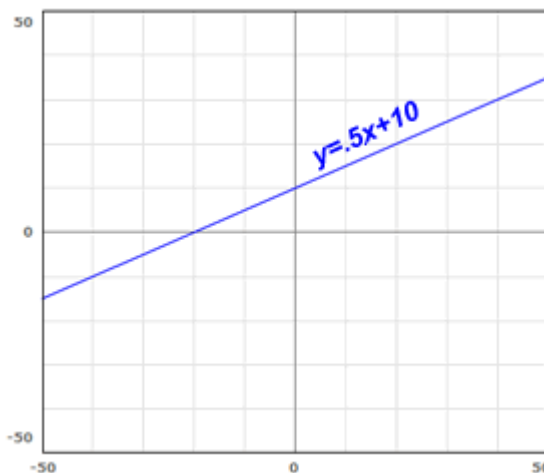


Definition

Domain: The domain of a function is the set of all possible input values (usually x), which allows the function formula to work.

Most often a function's domain is all real numbers. Consider a simple linear equation like the graph shown below. What values are valid inputs? Every number! It's range is all real numbers because there is nothing that won't work. The graph extends forever in the x direction.



What kind of functions don't have a domain of all real numbers? The kinds of functions that aren't valid for particular input values. Here is an example:

$$y = \frac{3}{x-1}$$

What is the value of y when $x=1$? Well, it's 3 divided by 0, which is undefined. Therefore 1 is not in the domain of this function. All other real numbers are valid, so the domain is all real numbers except for $x=1$.

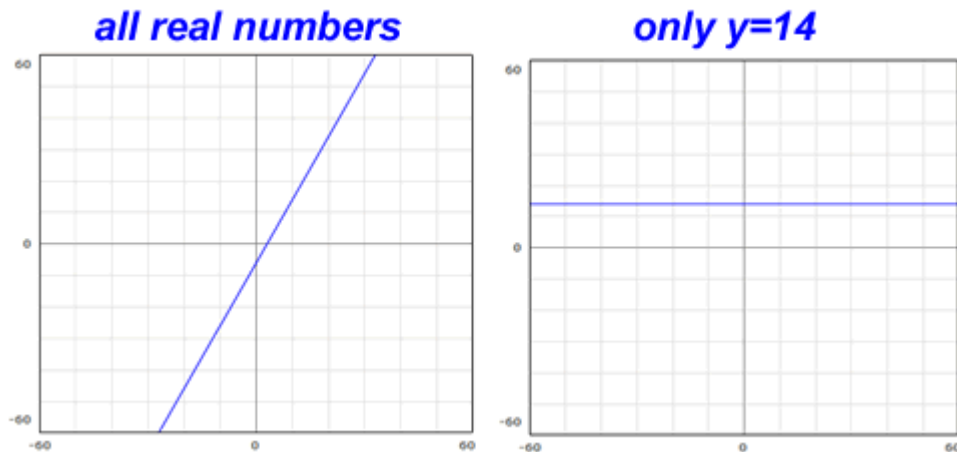
What other kinds of functions have domains that aren't all real numbers? The inverse trig functions have limited domains as well. Since the sine function can only have outputs from -1 to 1, its inverse can only accept inputs from -1 to 1. The domain of inverse sine is -1 to 1. However, **the most common reason for limited domains is probably the divide by zero issue.** When finding the domain of a function, first look for any values that cause you to divide by zero.

Definition

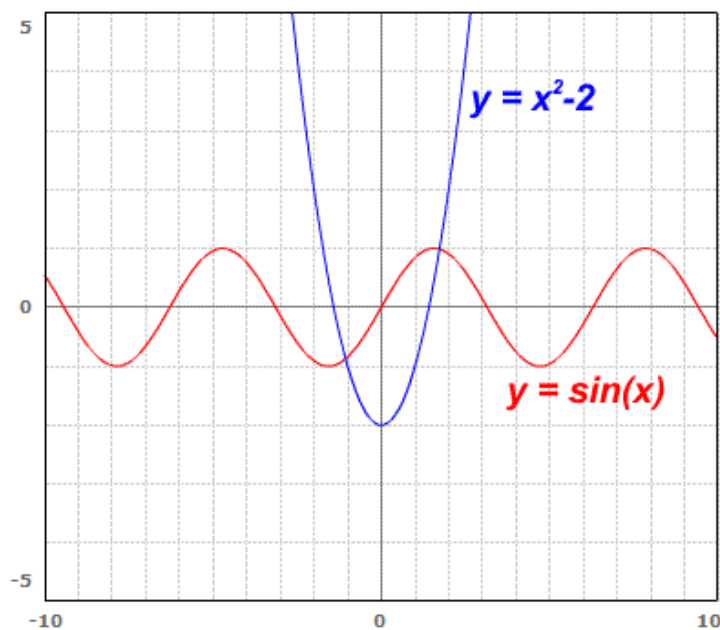
Range: The range is the set of all possible output values (usually y), which result from using the function formula.

The range of a simple linear function is almost always going to be all real numbers. A graph of a line, such as the one shown below on the left, will extend forever in either y direction. There's one notable exception: $y=\text{constant}$. When you have a function where y equals a constant (like

$y=3$), your graph is a horizontal line. In that case, the range is just that one value. Otherwise, the range is all real numbers.



Many other functions have limited ranges. While only a few types have limited domains, you will frequently see functions with unusual ranges. Here are a few examples:



As you can see, these two functions have ranges that are limited. No matter what values you enter into a sine function you will never get a result greater than 1 or less than -1. No matter what values you enter into $y=x^2-2$ you will never get a result less than -2.

Summary: The domain of a function is all the possible input values, and the range is all possible output values.

