

# What is a Function?

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**function/mapping:** a mapping (also called a function) is a rule that assigns to every element  $x$  of a set  $X$  a single element of a set  $Y$ . It is written as:

$$f : X \rightarrow Y$$

where the arrow indicates mapping, and the letter  $f$  symbolically specifies a rule of mapping. When we write:

$$y = f(x)$$

we are mapping from argument  $x$  in domain  $X$  to value  $y$  in co-domain  $Y$ .

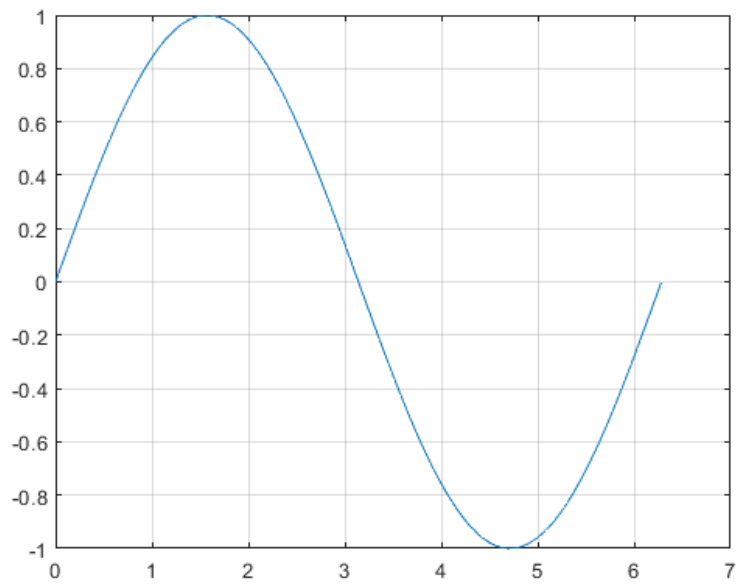
## **Definitions:**

- **domain:** big  $X$  is the domain of  $f$
- **argument:** little  $x$  is an element in big  $X$ , an argument of the function  $f$ .
- **co-domain:** big  $Y$  is the co-domain of  $f$ .
- **image/value:** when  $y = f(x)$ , we refer to  $y$  as the image or value of  $x$  under  $f$ .
- **range:**  $f(X) = \{y \in Y : y = f(x) \text{ for some } x \in X\}$

In some textbooks,  $x$  is called independent or exogenous variables, and  $y$  is called dependent or endogenous variables. We will avoid using those words to avoid confusion.

## ***This is a function:***

```
figure();  
x = 0:pi/100:2*pi;  
y = sin(x);  
plot(x,y);  
grid on;
```



***This is NOT a function:***

```
figure();
x = 1; y=1; r=1;
th = 0:pi/50:2*pi;
xunit = r * cos(th) + x;
yunit = r * sin(th) + y;
h = plot(xunit, yunit);
grid on;
```

