

### The Domain and Range of a Function



#### Preliminaries

- Functions

#### Objectives

- Determine which numbers can be inputs for a function
- Determine which numbers can be outputs of a function

### Definition

#### Domain

A list of all possible inputs to a function

### Example 1

$$f(x) = x + 3$$

Domain : All real numbers

$$\mathbb{R}$$

## Example 2

$$f(x) = \frac{1}{x}$$

Domain :  $x$  is not equal to zero

Formal Notation

Domain :  $\{x \mid x \neq 0\}$

## Example 3

$$f(x) = \sqrt{x}$$

Domain :  $x$  is not negative

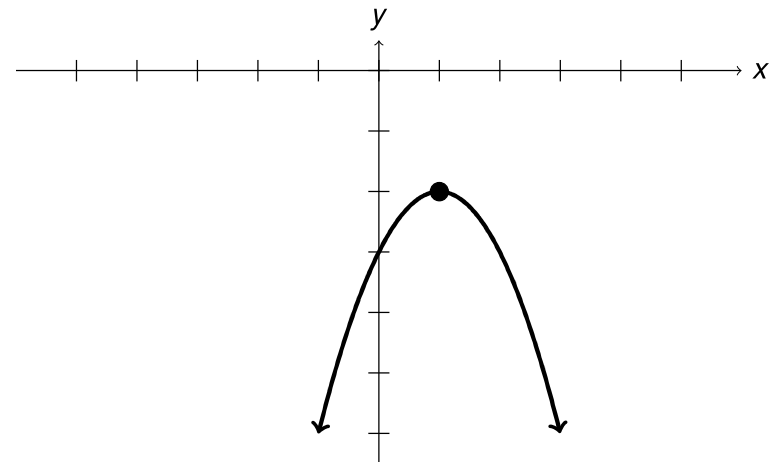
$\{x \mid x \geq 0\}$

## Definition

### Range

A list of all possible outputs of a function

## Example 9: $y = -(x - 1)^2 - 2$



Range:  $\{y \mid y \leq -2\}$

## Recap

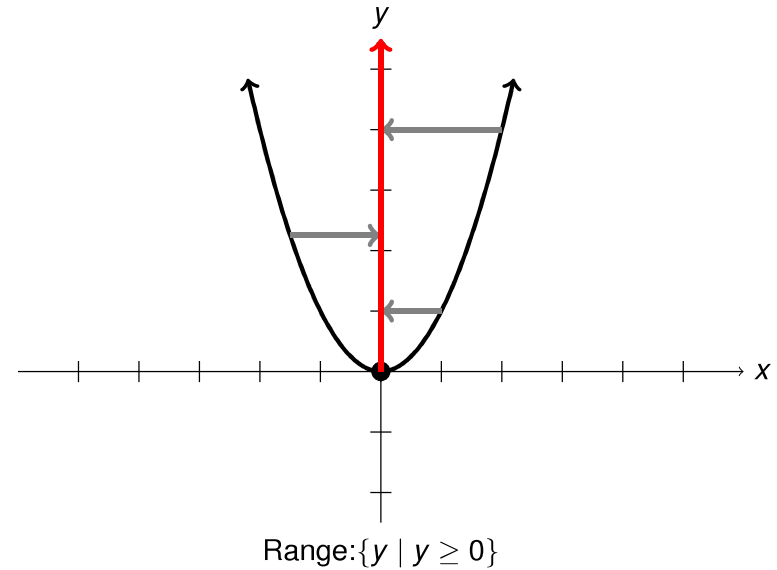
### Domain

A list of all possible inputs to a function

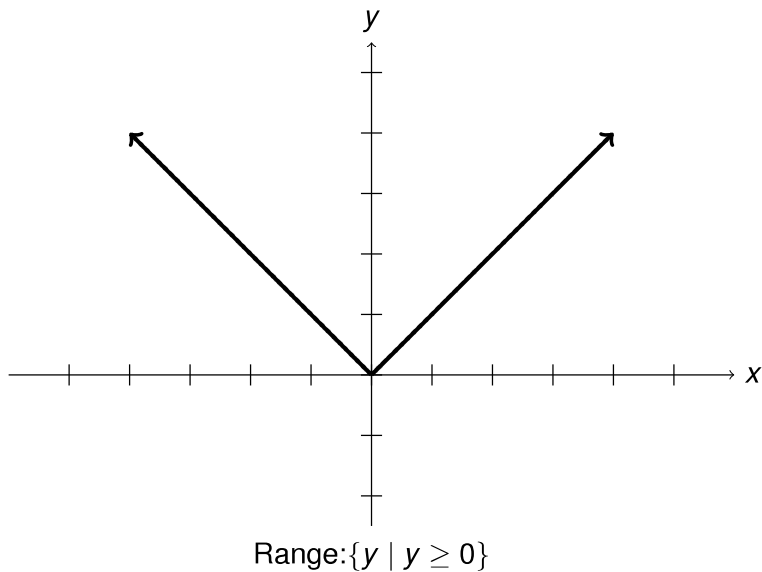
### Range

A list of all possible outputs of a function

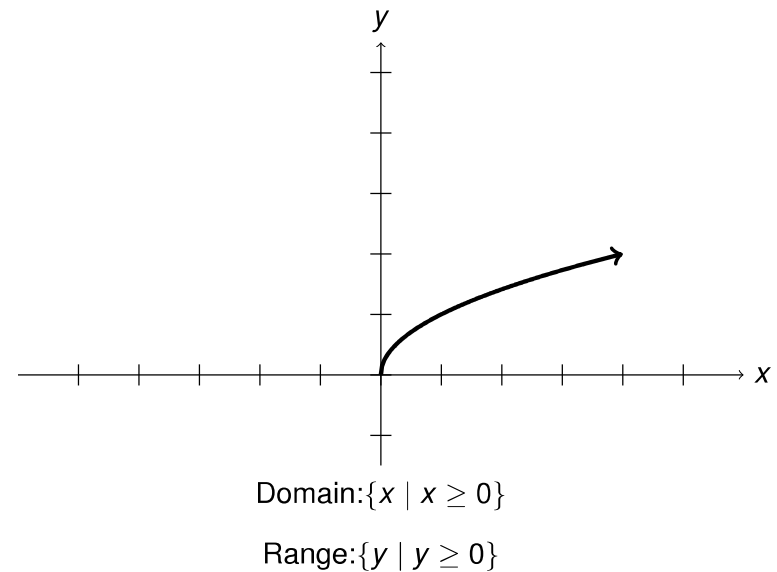
## Example 6: $y = x^2$



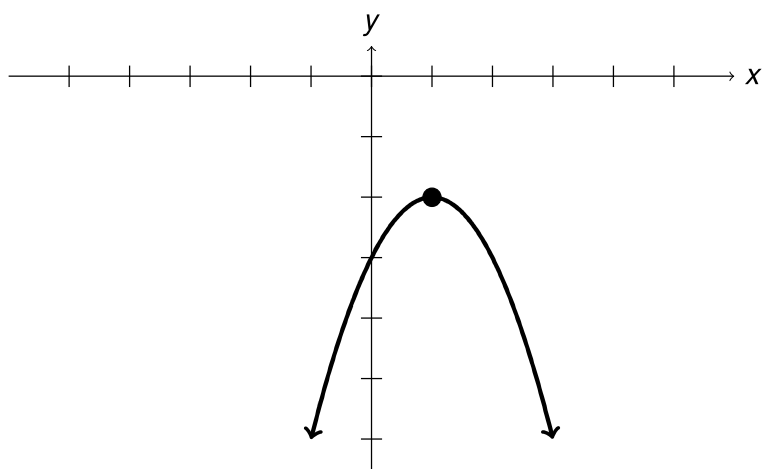
## Example 7: $y = |x|$



## Example 8: $y = \sqrt{x}$



### Example 9: $y = -(x - 1)^2 - 2$



Range:  $\{y \mid y \leq -2\}$

### Recap

#### Domain

A list of all possible inputs to a function

#### Range

A list of all possible outputs of a function