

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

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

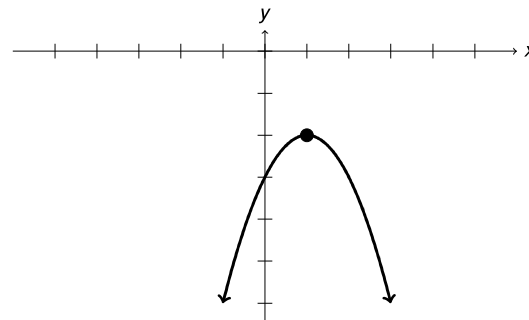
$$\{x \mid x \geq 0\}$$

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

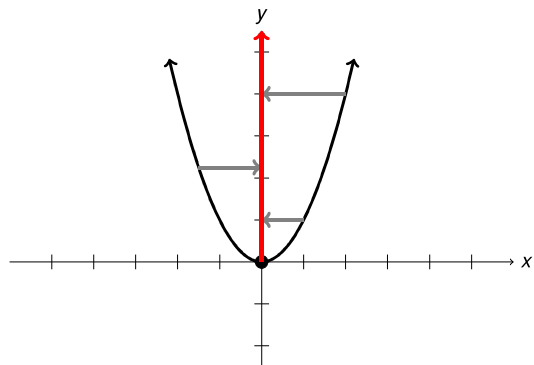
Domain

A list of all possible inputs to a function

Range

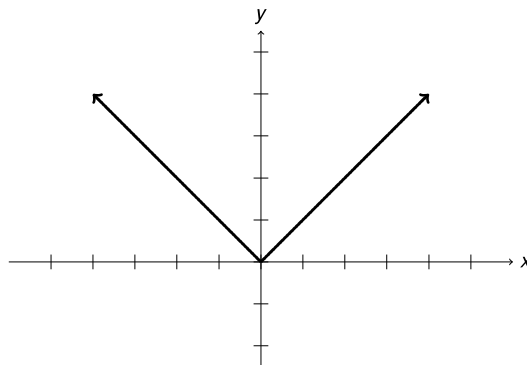
A list of all possible outputs of a function

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



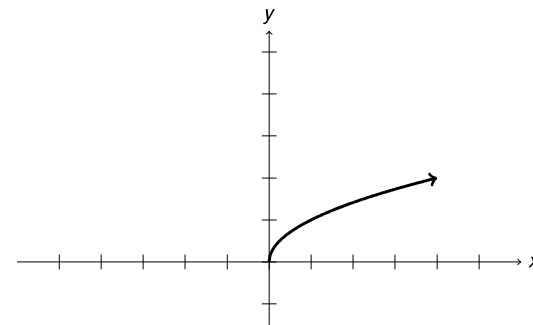
Range:  $\{y \mid y \geq 0\}$

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



Range:  $\{y \mid y \geq 0\}$

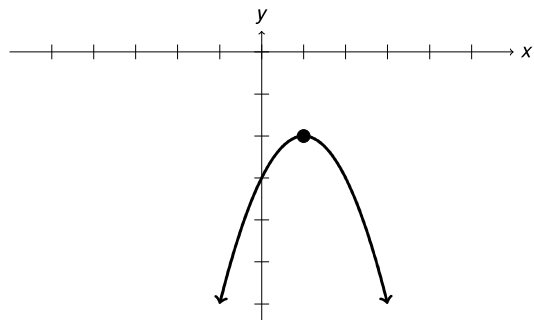
**Example 8:**  $y = \sqrt{x}$



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

Range:  $\{y \mid y \geq 0\}$

**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