# 2.2. Functions and Graphs

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Objectives: (1) Identifying Functions

(2) Finding Function Values

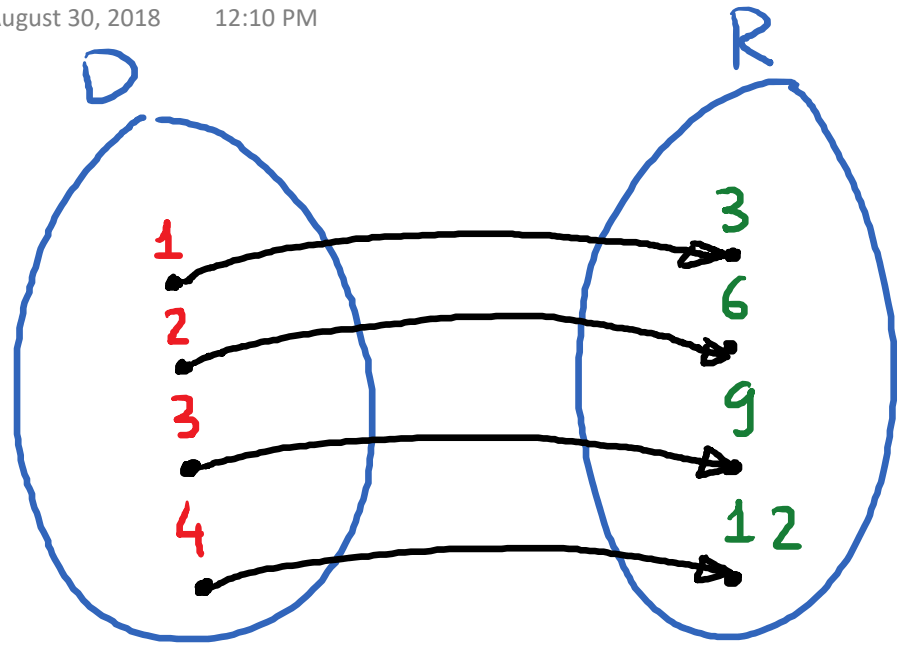
(3) Graphs of Functions

(4) The Vertical-line Test

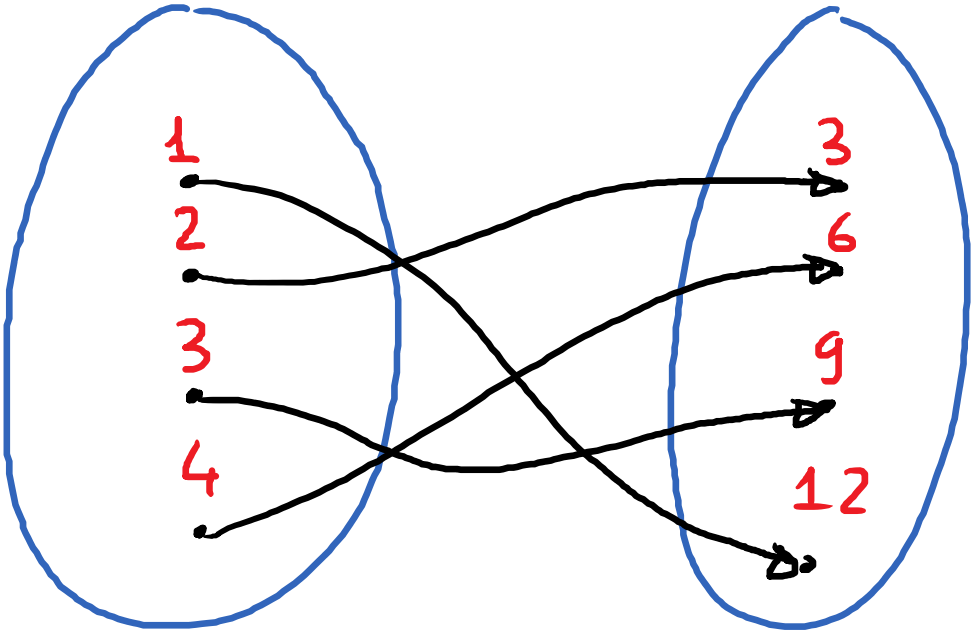
## (1) Definition of a function:

A function is a **correspondence** between a first set called the **domain** and a second set called a **range** such that each member of the domain corresponds to **exactly one** member of the range.

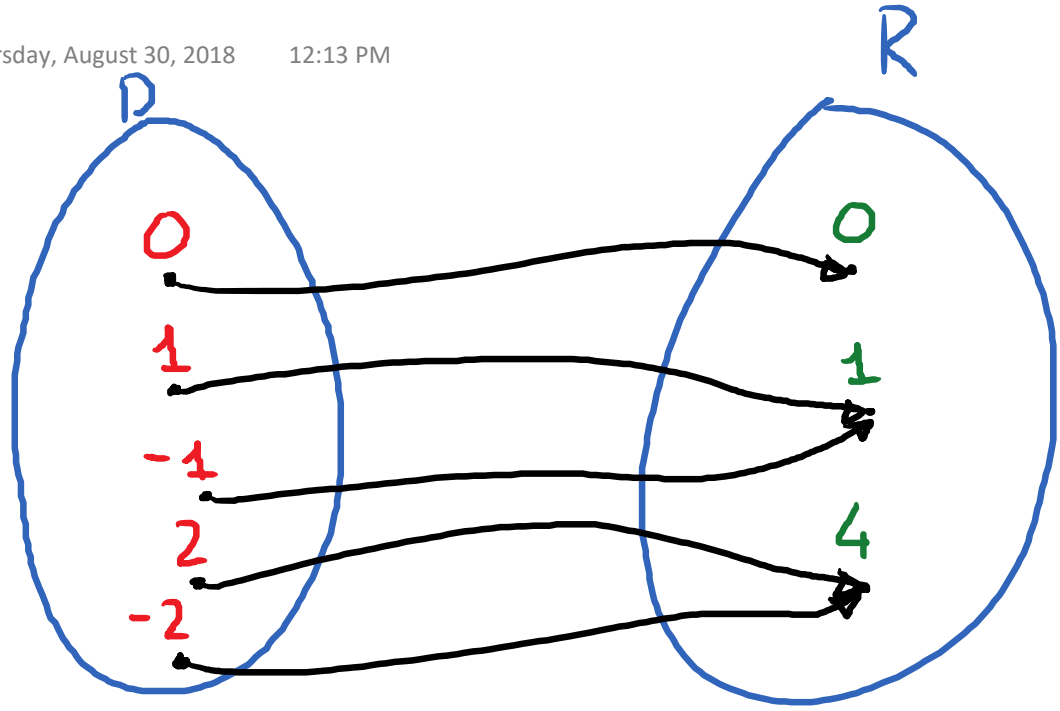
E.g.



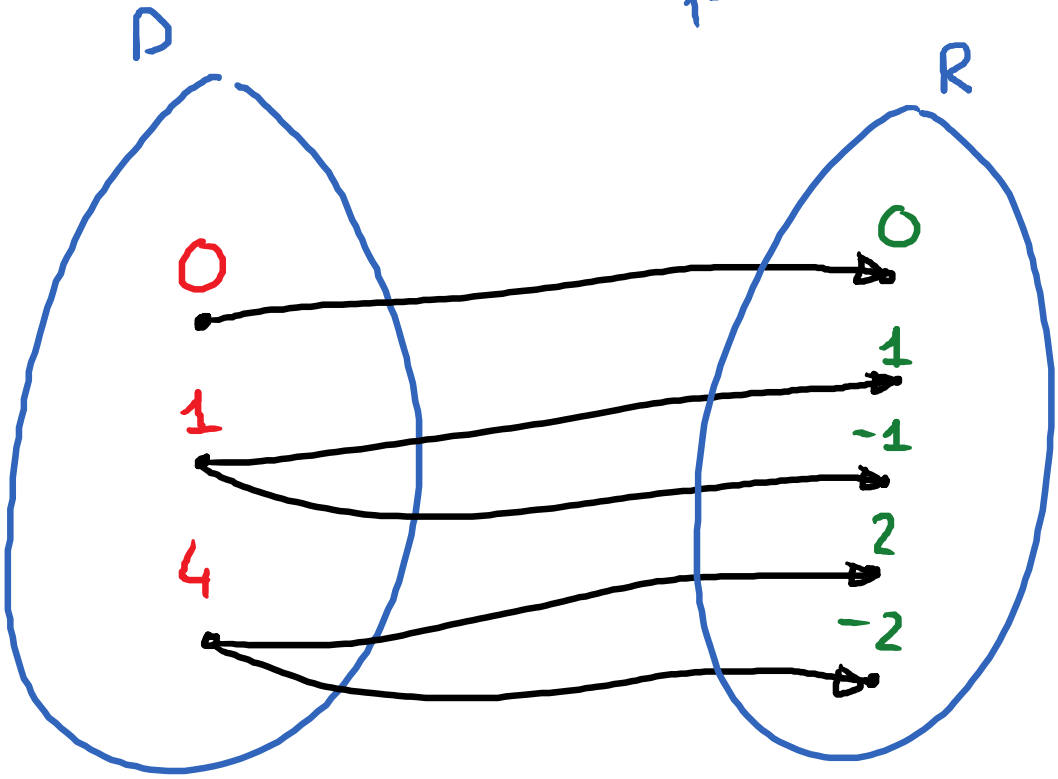

This is a function




This is a function.




This is a function.




Because 1 in D corresponds to more than one members of the range

This is not a function.

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E.g. Domain: a set of numbers

Range: a set of numbers

Correspondence: take a number in the domain and take the cube of it to obtain a number in the range.

$$y = x^3$$

## (2) Finding function values.

Most functions will be given to us as an equation.

For e.g. $y = x^3$ or $y = x^2$ or $y = \sqrt{x}$ ; etc.

We use the notation:

$f(x) = x^3$ or $f(x) = x^2$ or $f(x) = \sqrt{x}$; etc.

to denote these functions.

read as f of x or the value of the function f at x.

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name of the function.

E.g. $f(x) = x^2$. ← placeholder

$f(2) = (2)^2 = 4$

read as f of 2 and it means we need to find the value in the range that corresponds to x = 2 in the domain

$f(-2) = (-2)^2 = 4$.

## More examples of evaluating functions.

E.g. $g(x) = 3 - 4x$

Find $g(0) = 3 - 4\cdot(0) = 3$

$g(-1) = 3 - 4\cdot(-1) = 7$

$g(s) = 3 - 4\cdot(s) = 3 - 4s$

$$g(\boxed{x+1}) = 3 - 4\cdot(\boxed{x+1})$$

$$= 3 - 4x - 4 = \boxed{-4x - 1}$$

$$g(\boxed{2x}) = 3 - 4(\boxed{2x}) = \boxed{3 - 8x}.$$

$$g(\boxed{-x+2}) = 3 - 4(\boxed{-x+2})$$

$$= 3 + 4x - 8 = \boxed{-5 + 4x}$$