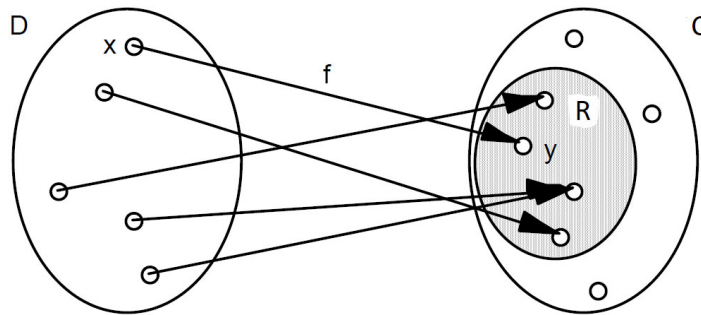# Function

Definition and examples

Def.:   A **function** f is a rule that associates to **each** element x in a set D **exactly one** element y in a set C.
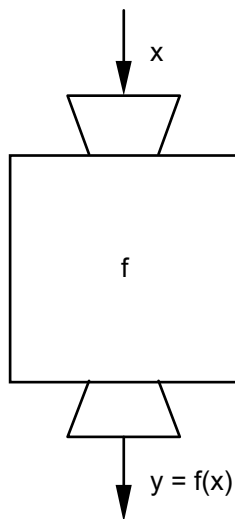

The function f **maps** the set D onto the set C.

f: D → C
       x ↦ y = f(x)   ("f of x")

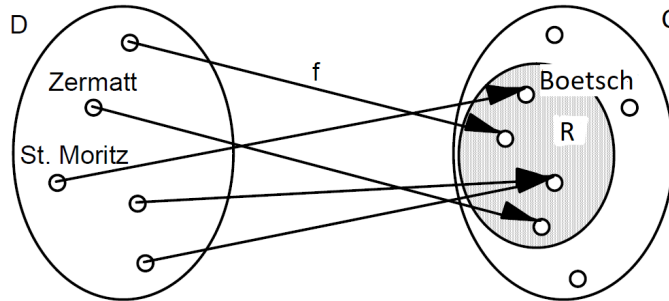The set D is the **domain**, the set C is the **codomain**, and the set R is the **range** of the function f.

The element y is the **image** of the element x.
or (if D and C are number sets): y is the **value** of f at x.

Ex.:   1.   D = set of all Swiss holiday resorts
            C = set of all human beings

f: D → C
          r ↦ d = f(r) = director of holiday resort r

2.   D = set of all countries of the world
     C = set of all cities of the world

f: D → C
          a ↦ b = f(a) = capital of country a

3.   Cable car company

D = ℕ   (= set of natural numbers)
C = ℝ   (= set of real numbers)

f: ℕ → ℝ
          n ↦ r = f(n) = revenue (e.g. in CHF) when n tickets are sold

4.   D = ℕ
     C = ℤ

f: ℕ → ℤ
          n ↦ y = f(n) = n - 4

5.   D = C = ℝ
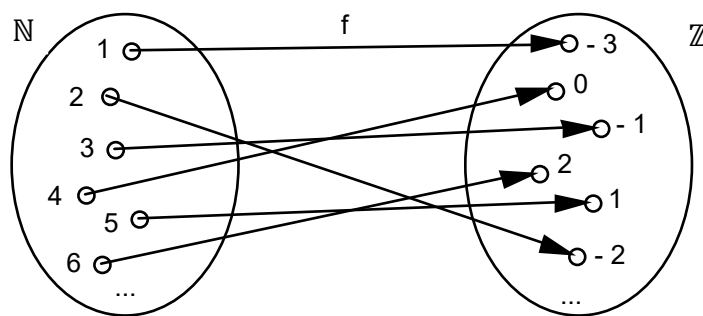
p: ℝ → ℝ
          x ↦ y = p(x) = $\dfrac{x^3 - 3}{2x^2 + 1}$

Representation of a function

Arrow diagram
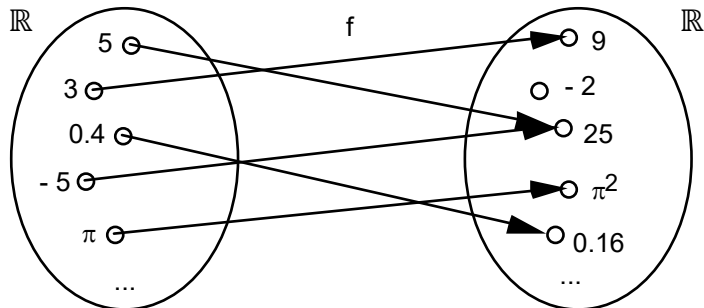
Table of values

x	y
1	1
3	9
5	25
- 5	25
0.4	0.16
...	...

Equation

f: $\mathbb{R} \to \mathbb{R}$

        $x \mapsto y = f(x) = x^2$

Graph