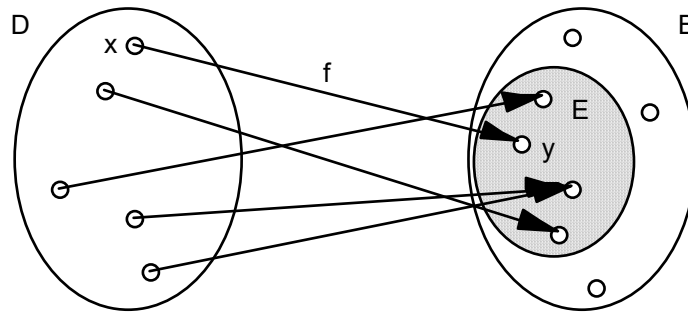


Function

Definition and examples

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

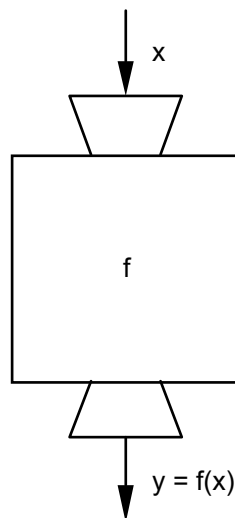


The function f **maps** the set D onto the set B .

$$\begin{aligned} f: D &\rightarrow B \\ x &\mapsto y = f(x) \quad ("f \text{ of } x") \end{aligned}$$

The set D is the **domain**, the set B is the **codomain**, and the set E is the **range** of the function f .

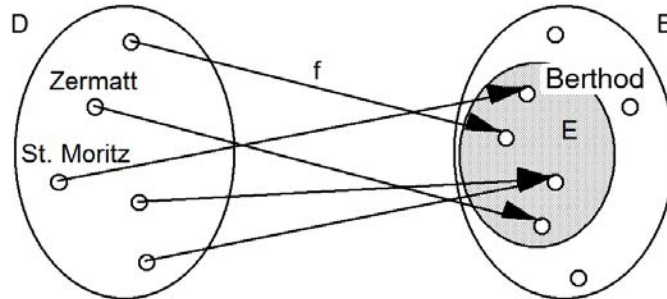
The element y is the **image** of the element x .
or (if D and B are number sets): y is the **value** of f at x .



- Ex.: 1. $D = \text{set of all Swiss holiday resorts}$
 $B = \text{set of all human beings}$

$$f: D \rightarrow B$$

$$r \mapsto d = f(r) = \text{director of holiday resort } r$$



2. $D = \text{set of all countries of the world}$
 $B = \text{set of all cities of the world}$

$$f: D \rightarrow B$$

$$a \mapsto b = f(a) = \text{capital of country } a$$

3. Cable car company

$$D = \mathbb{N} \quad (= \text{set of natural numbers})$$

$$B = \mathbb{R} \quad (= \text{set of real numbers})$$

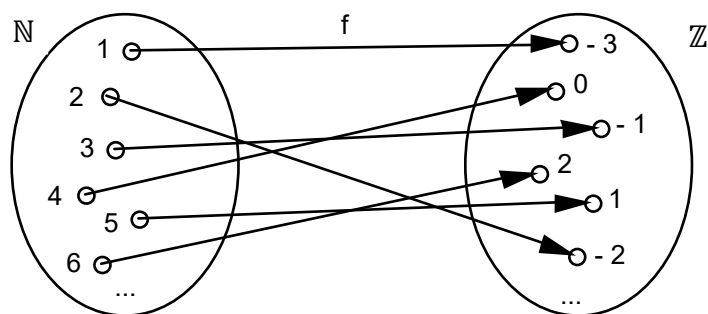
$$f: D \rightarrow B$$

$$n \mapsto r = f(n) = \text{revenue (e.g. in Euros) when } n \text{ tickets are sold}$$

4. $D = \mathbb{N}$
 $B = \mathbb{Z}$

$$f: \mathbb{N} \rightarrow \mathbb{Z}$$

$$n \mapsto y = f(n) = n - 4$$



5. $D = B = \mathbb{R}$

$$p: \mathbb{R} \rightarrow \mathbb{R}$$

$$x \mapsto y = p(x) = \frac{x^3 - 3}{2x^2 + 1}$$

Representation of a function

Arrow diagram

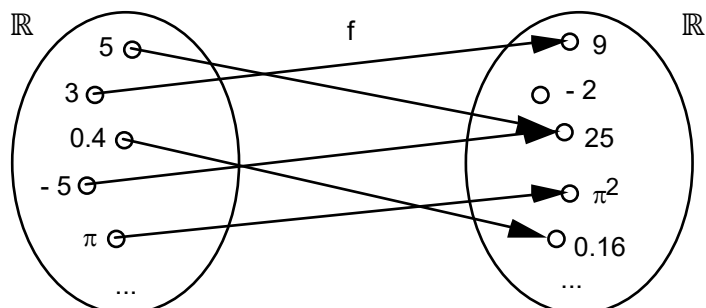


Table of values

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

Equation

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

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

Graph

