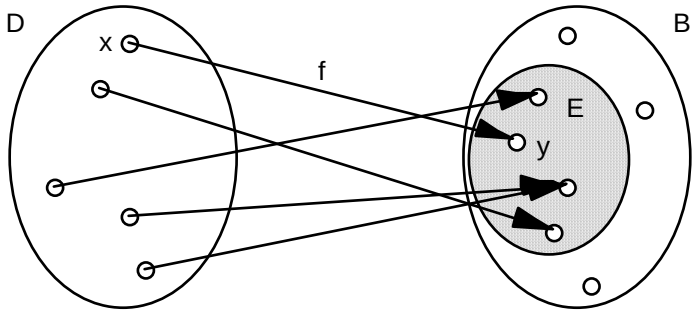
Function

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.

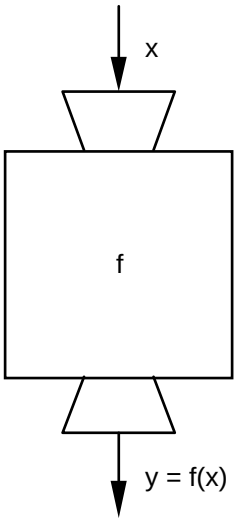


The function f **maps** the set D onto the set B.

f: $D \rightarrow B$
$x \rightarrow y = f(x)$ ("f of x")

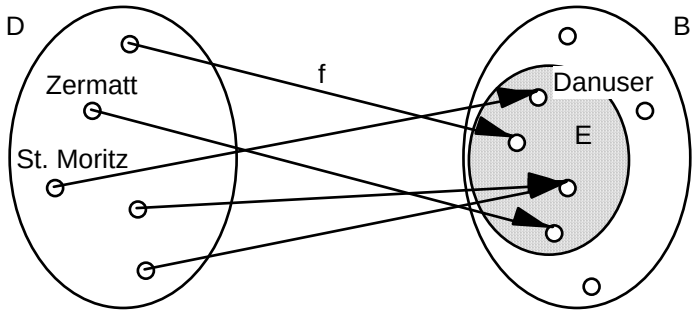
The set D is the **domain**, the set B is the **codomain**, and the set E is the **range** of the function f.

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 = set of all the Swiss holiday resorts
B = set of all the human beings

f: $D \rightarrow B$
$r \rightarrow d = f(r)$ = director of holiday resort r



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

f: $D \rightarrow B$
$a \rightarrow b = f(a)$ = capital of country a

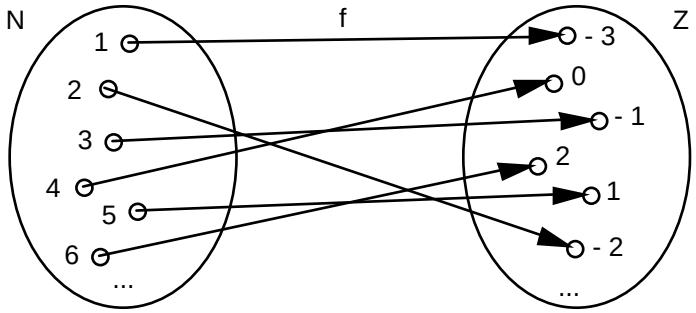
3. Cable car company

$D = \mathbb{N}$ (= set of natural numbers)
$B = \mathbb{R}$ (= set of real numbers)

f: $D \rightarrow B$
$n \rightarrow r = f(n)$ = revenue (e.g. in Euros) when n tickets are sold

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

f: $\mathbb{N} \rightarrow \mathbb{Z}$
$n \rightarrow y = f(n) = n - 4$



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

p: $\mathbb{R} \rightarrow \mathbb{R}$
$x \rightarrow y = p(x) = \frac{x^3 - 3}{2x^2 + 1}$

Representation of a function

Arrow diagram

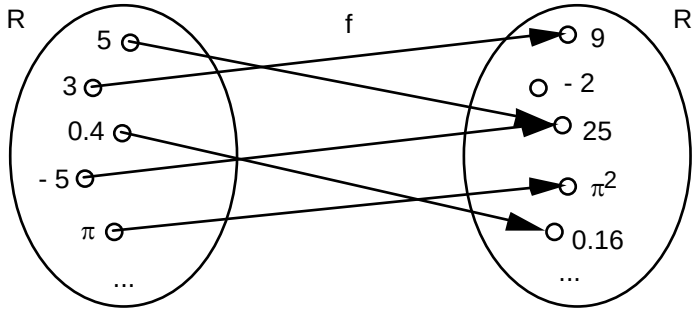


Table of values

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

Equation

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

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

Graph