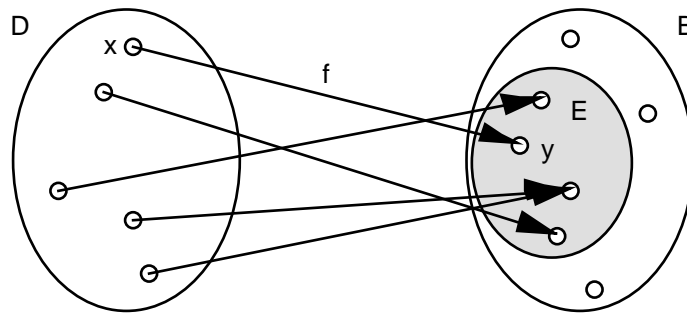


# Function

## 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  $B$ .

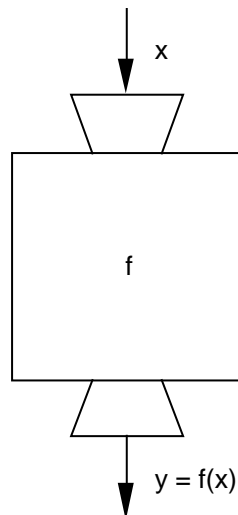


The function  $f$  **maps** the set  $D$  onto the set  $B$ .

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

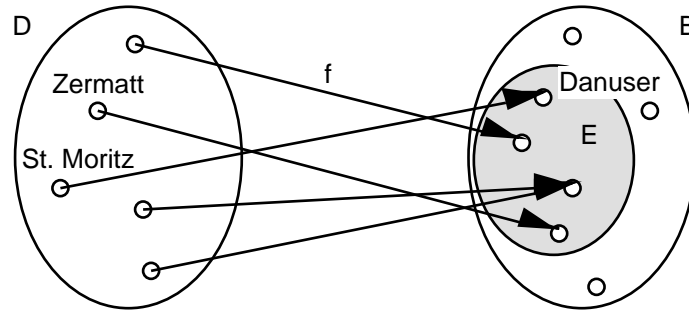
The set  $D$  is the **domain**, the set  $B$  is the **codomain**, and the set  $E$  is the **range** of the function  $f$ .

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 B  
 r 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 B  
 a b = f(a) = capital of country a

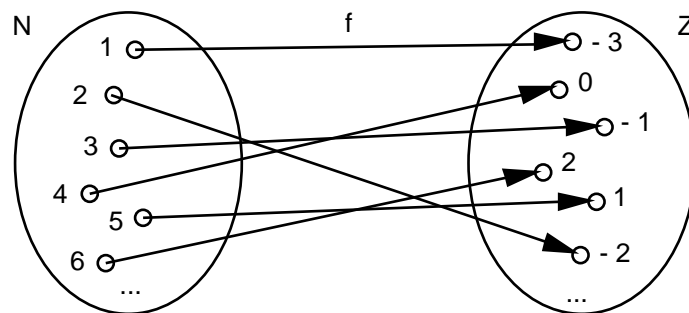
3. Cable car company

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

f: D B  
 n p = f(n) = profit (e.g. in Euros) when n tickets have been sold

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

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

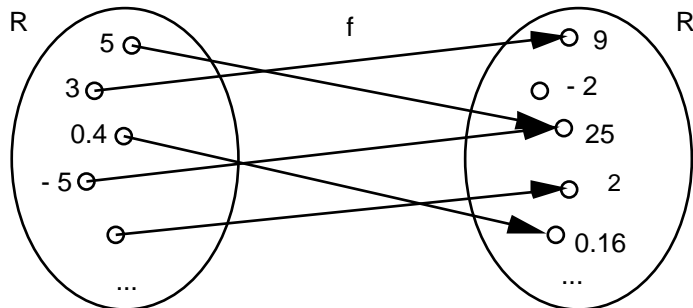


5. D = B =  $\mathbb{R}$

p:  $\mathbb{R}$   $\mathbb{R}$   
 x 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
...	...

### Formula

$$f: \begin{array}{l} \mathbb{R} \\ x \end{array} \rightarrow \begin{array}{l} \mathbb{R} \\ y = f(x) = x^2 \end{array}$$

### Graph

