### Definition: Function

BLet is a relation that assigns an element from A and B be non-empty sets. Then a function f : A → Bf : A → B B to each element from ff with domain (of definition) f A BA A in a unique way.B A and range

For this we write , which is spoken as “ is a mapping from to .” The expression is often simply written as , if and are obvious from the

If an x ∈ A is given, then the element from x B, which is uniquely determined by the assign-f f x x ff(x) context.

ment rule, is called the image or function value of at the position . One writes to express this. The is then also called the argument or input value of the function . Note that we may speak of “the” image of the function at the position because of its unam-

If preimage.an image) need not be unique (because there could well be same function value f(x) = y, then x is called a preimage of y, i.e., f(x1) = y = f(xy under 2) with f. Note that an preimage (as opposed tox1 ≠ x2)different. That is why we speak of “a” x1, x2that map to the biguousness.

The set f(A) ∶= {y ∈ B|∃ x ∈ A : f(x) = y} ⊆ BB is called the image (or image set) of f(A) = Bf(A) ≠ B f.

Note that (depending on the function under consideration) it can be that , since not every element of must have a preimage. Functions for which have a spe-

Two figures f : A → BA and C g : C → D have the same name if B A = CD and f B = Dg and if cial name. each element from (or ) is assigned the same element in (or ) by and .