

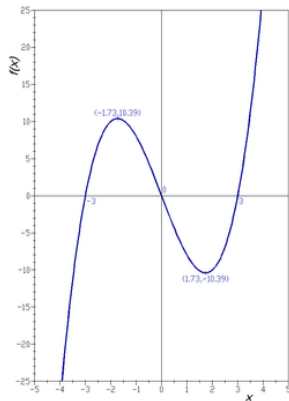
Definitions of Function

A function of a variable quantity is an analytic expression composed in any way whatsoever of the variable quantity and numbers or constant quantities. —Euler, 1748.

The general concept of a function requires that a function of x be defined as a number given for each x and varying gradually with x . The value of the function can be given either by an analytic expression, or by a condition that provides a means of examining all numbers and choosing one of them; or finally the dependence may exist but remain unknown. —Lobachevsky, 1834.

Let E and F be two sets, which may or may not be distinct. A relation between a variable element x of E and a variable element y of F is called a functional relation in y if, for all x in E , there exists a unique y in F which is in the given relation with x . —Bourbaki, 1939.

Images of Function in School Mathematics



x	y
1	3
2	6
3	9
4	12
5	15

$$y = x^2 + x + 1$$

$$f(x)$$

Two Problems

- ▶ Conceptualizing the domain and range as objects
- ▶ Conceptualizing the function as object

The K-12 Number Line: Is it built, or occupied?

At the end of high school Anne can meaningfully hear, “Let $f(x)$ be a function of a real variable x .” The home of this x is the real number continuum \mathbb{R} . How did this \mathbb{R} , with its rich algebraic and geometric structure, make itself progressively known to the first grade Anne, presumed to know little more than simple cardinal counting? There are two possible narratives meant to accomplish this.

USA and South Korean teachers meanings for function and function notation as a potential source of differences in students learning

US National Council of Teachers of Mathematics, in its Principles to Actions (NCTM, 2014), said "Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments. But, a teacher will not consciously support the building of a shared understanding that the teacher does not share. I will report a study of ways that 253 USA and 368 South Korean teachers understand the ideas of function and function notation, and will provide researchable hypotheses about their potential effects on student learning.