

Graphs from Graphs

The word *graph* is used in several ways in mathematics. We refer to the graph $y = f(x)$ as a set of points in the plane. A *finite graph* consists of a finite set of vertices (or nodes), some of which are connected by *edges* – curves from one vertex to another or from a vertex to itself.

The function graph on the left shows $f : [0, 3] \rightarrow [0, 3]$; the graph consists of three line segments pasted together. If we define $a = [0, 1]$ and $b = [1, 2]$ and $c = [2, 3]$, then we see, for example, that $b \subseteq f(a)$. We form an *edge* $a \rightarrow b$ to indicate this. The finite graph on the right keeps track of what f does to the intervals a, b, c . There is a connection between the behavior of f and paths along edges in the graph on the right. This subject is called *symbolic dynamics* and it is a prominent area of mathematics research.