Section 1: Finding Limits Graphically and Numerically

Finding Limits Graphically and Numerically

Definition of limits:

Let $f(x)$ be a function defined at all values in an open interval containing a, with the possible exception of a itself, and let L be a real number. If *all* values of the function $f(x)$ approach the real number L as the values of x (except for $x = a$) approach the number a, then we say that the limit of $f(x)$ as x approaches a is L.

$$\lim_{x\to a} f(x) = L$$

Remark about limit:

1. The function $f(x)$ does not need to be defined at a. The emphasis is on the word "approach."
2. Another key point is that "all" values of the function $f(x)$ must approach the same number L. This means $f(x)$ must approach L whether x is approaching a from the left or from the right.
3. If a function $f(x)$ is continuous at a, then the limit of $f(x)$ at a is $f(a)$.

Example 1: Find

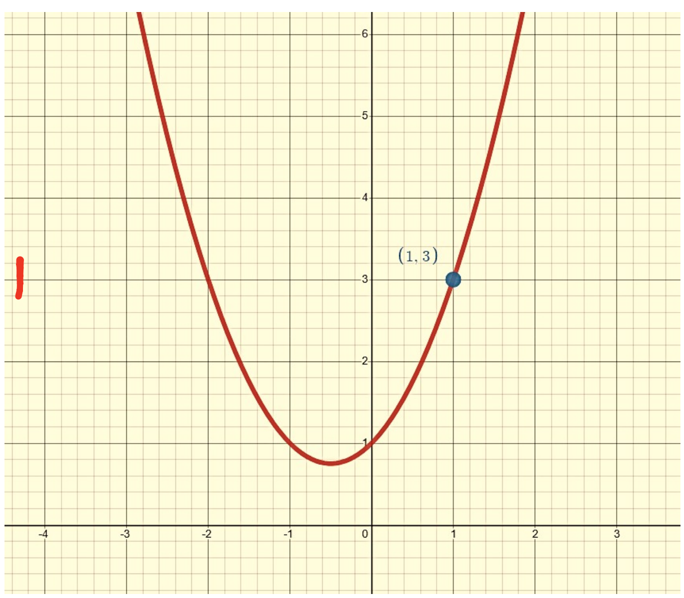
$$\lim_{x\to 1} x^2 + x + 1 = 3$$

A graphical method shows the limit of $f(x) = x^2 + x + 1$ as x approaches 1 is 3.

$f(x) = x^2 + x + 1$

$f(1) = (1)^2 + (1) + 1$

$= 3$



as $x \to 1$

$y \to 3$