Concepts

Topics covered are:

1. Limits
2. Continuity

Limits

Let $f(x)$ be a function defined on (a, b) except at c. Then, as x approaches c, if f(x) approaches L, then we say

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

A limit exists at x = c if:

$$LHL = \lim_{x \to c-} f(x) = L = RHL = \lim_{x \to c+} f(x) = L$$

Continuity

A function f(x) is said to be continuous in (a, b) if:

$$\lim_{x \to c-} f(x) = \lim_{x \to c+} f(x) = f(c) \, \forall \, c \in (a, b)$$

Otherwise, it is said to be discontinuous. Continuity of a function can be found at a point in the function as well.

Graphically, a function is continuous if its graph is smooth. i.e. There are no breaks throughout its domain.

Uses

Limits: Predicting what a function value could be if it was defined at a point. Especially for functions where undefined points exist.

Continuity: As an extended topic of limits, it is useful to check if a function has any breakpoints, without actually having to draw the graph.