

Continuity

When the limit of a function exists

(i.e. $\lim_{x \rightarrow c^+} f(x) = \lim_{x \rightarrow c^-} f(x)$ so $\lim_{x \rightarrow c} f(x)$ exists)

and the value of the function is the same as the limit at a point c

(i.e. $\lim_{x \rightarrow c} f(x) = f(c)$)

we say that the function is continuous at c .

In example 2 $f(x)$ is continuous at c . As a matter of fact $f(x)$ is continuous everywhere in this example.

In example 1 $f(x)$ is not continuous at $x = c$, but it is continuous everywhere else.

Here's an intuitive way to think of continuity: if you were to draw the graph of the function, it is continuous wherever you don't have to pick up your pencil (i.e. where there is no holes, gaps, or jumps).

In example 3 $f(x)$ is continuous from $(-\infty, 0)$ and $(0, \infty)$, but not at $x = 0$.