MIT 18.01 Single Variable Calculus, Fall 2007

This paper is not written by Massachusetts Institute of Technology (as they couldn't write such sh🌼t). This is simply a short summary of lectures made by me for me.

Lecture 2. What Is a Limit?

(In previous paper I've already touched limits (but I shouldn't)
Today we'll take it in more detail.

There are 2 types of limits we implement:
(they're all about the same, but with different details)

1. "Easy" limit.
   It is the way our value x *tends* be x0`

$$\lim_{x \to x0} = f(x0)$$

   Easy limit is easy (bruh). We can take value extremely close to x0.

2. Derivative limit.
   Simply the same thing but with derivative

$$\lim_{x \to x0} = f(x0 + \Delta x) - f(x0) / \Delta x$$

Done with nerd boring stuff. Now let's move on to… boring nerd stuff
(joke)

Limit types:

1. **Right-hand Limit**
   It's when our x $\to$ x0, but it's x > x0

$$\lim_{x \to x0+} =$$

2. **Left-hand Limit**
   It's when our x $\rightarrow$ x0, but it's x < x0

$$\lim_{x \rightarrow x0-} =$$

Continuity

Special way to describe our function as continuous or discontinuous.

Continuous: function is continuous when L and R limits exist and they are equal

Discontinuous

1. Jump discontinuity:
   Our L and R limits exist, but they are not equal (see scans for more info)
2. Removable discontinuity:
   L and R are equal, but they both don't exist
3. Infinite discontinuity:
   L or R or both limits are *inf* but defined
4. Strange behavior:
   Strange functions with no L and R limits

One more thing before I go…

<u>**Theorem:**</u>

If function f is differentiable (it has derivative at point X0)
f is continuous function.