LIMITS

- x is a number that changes (a variable)
- $f(x)$ denotes a function
- a, L are fixed numbers (constants, do not change)

Def: $\lim_{x \to a} f(x) = L$ if we can make the values of $f(x)$ arbitrarily close to L by taking x sufficiently close to a

Ex. $\lim_{x \to 1} \underbrace{\frac{x^2 - 1}{x - 1}}_{f(x)}$

$a = 1$

* $f(1) = \frac{0}{0}$, and this is a problem

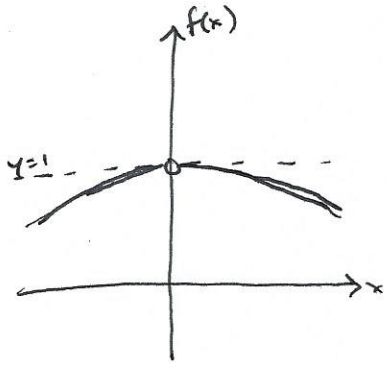
x	$f(x)$
0.9	$\frac{.81 - 1}{.9 - 1} = \frac{-.19}{-.1} = 1.9$
1.1	$\frac{1.21 - 1}{1.1 - 1} = \frac{.21}{.1} = 2.1$
.99	1.99
1.01	2.01
.999	1.999
1.001	2.001

$\lim_{x \to 1} f(x) = 1$

Ex. $f(x) = \frac{\sin(x)}{x}$

*note: $f(0) = \frac{\sin(0)}{0} = \frac{0}{0}$

$$\lim_{x \to 0} \frac{\sin(x)}{x} = 1$$



x	f(x)
$\pm .1$	.998334
$\pm .01$	.9999833
$\pm .001$	.9999998

Ex. $f(x) = \sin\left(\frac{1}{x}\right)$

$x \neq 0$

$\lim_{x \to 0} \sin\left(\frac{1}{x}\right)$ = Does Not Exist