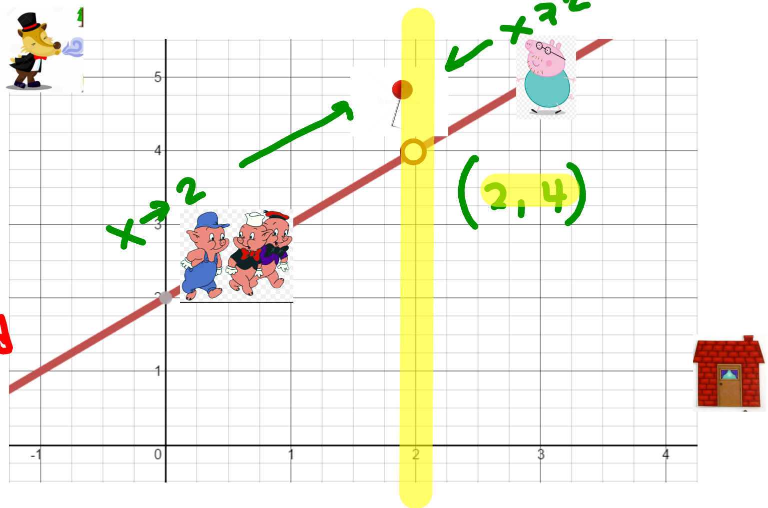
AP Calculus Sec 1.2 Finding Limits Graphically and Numerically

An Intro to Limits

$\lim_{x \to 2} f(x) = 4$

↑ y value of ordered pair

$f(2) =$ undf.



Without a calculator: $y = \frac{(x^2 - 4)}{(x - 2)} = \frac{0}{0}$ → undef. What happens at x = 2?

To get a better idea of what is happening as x gets closer to 2, lets make a T-chart and look at the points on either side of 2.

$\lim_{x \to 2} f(x) =$

x	1.75	1.9	1.99	1.999	2	2.001	2.01	2.1	2.25
f(x)	3.75	3.9	3.99	3.999	undef	4.001	4.01	4.1	4.25

→ 4   4 ←

$\frac{1}{0} =$ undf

$\frac{0}{1} = 0$

We can use limit notation by writing: $\lim_{x \to 2} f(x) = 4$

read "the limit as x approaches 2 of f(x)"

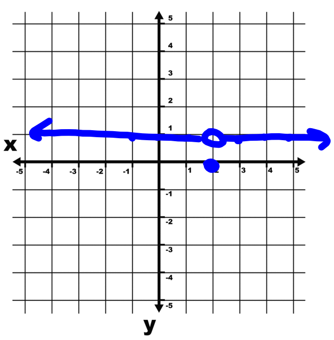
The informal definition is: $\lim_{x \to c} f(x) = L$

There are 3 ways to find limits:

1. by tables
2. by graphing
3. analytically (next section)

example: find $\lim_{x \to 2} f(x) = \begin{cases} 1, & x \neq 2 \\ 0, & x = 2 \end{cases}$ (y =)

This is what is known as a piecewise function, best way to determine limit is to graph it.



x	y
-1	1
0	1
1	1
1.9999	1
2	0
3	1
4	1
5	1

$f(2) = 0$

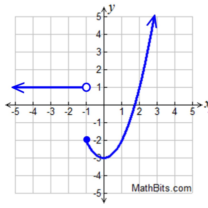
$\lim_{x \to 2} f(x) = 1$

Limits that Fail to Exist

DNE
does not exist

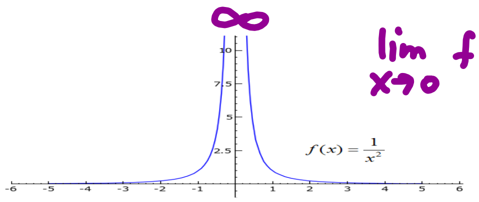
Three types:

1. Behavior that differs from left to right



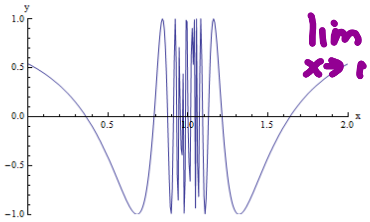
$\lim_{x \to -1} f(x) = DNE$

2. Unbounded behavior



$\lim_{x \to 0} f(x) = DNE$

3. Oscillating behavior



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

The next step is looking at how to find the limit analytically.

See the next section...