We Love

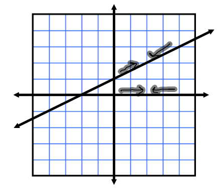
Calculus AB

1-2
Limits

Examine: $f(x) = \frac{1}{2}x + 1$

$f(0) = 1$

$f(2) = 2$

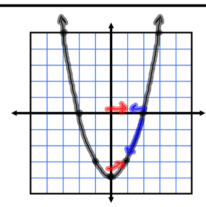


New Concept: $\lim_{x \to 2} f(x) = 2$

All evidence when examining the values close to x = 2 indicates that the y value should equal 2 (but it doesn't have to.)

One sided limits:

Examine: $f(x) = x^2 - 4$



Left-hand Limits -

$\lim_{x \to 1^-} f(x) = -3$

Right-hand Limits -

$\lim_{x \to 1^+} f(x) = -3$

Theorem - The existence of a limit

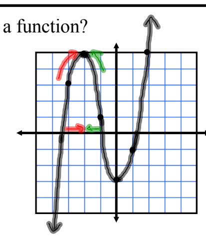
$\lim_{x \to a} f(x)$ only exists if $\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x)$

Does $\lim_{x \to 1} f(x)$ exist? If so, what is it? -3

How is evaluating a limit different from evaluating a function?

Consider:

$f(x) = x^3 + 3x^2 - 2x - 3$



$\lim_{x \to -2^-} f(x) = 5$

$\lim_{x \to -2^+} f(x) = 5$

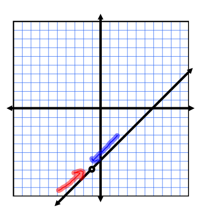
$\lim_{x \to -2} f(x) = 5$

$f(-2) = 5$

Why do we even need this?!?

Using your calculator, graph

$f(x) = \dfrac{x^2 - 5x - 6}{x + 1}$

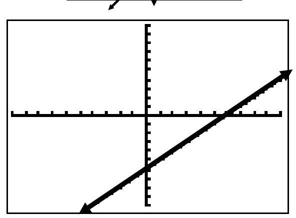


$\lim_{x \to -1^+} f(x) = -7$

$\lim_{x \to -1^-} f(x) = -7$

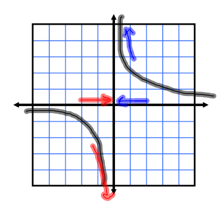
$\lim_{x \to -1} f(x) = -7$

$f(-1) = \varnothing$



Examine the graph of

$f(x) = \frac{1}{x}$



$\lim_{x \to 0^-} f(x) = -\infty$

$\lim_{x \to 0^+} f(x) = \infty$

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

Handout
4 - 11 all

(excerpt from the
Stewart book)