Understanding Limits Graphically and NumericallyV2NOTES.notebook September 07, 2017







Aug 8-7:31 PM









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Limits are the "backbone" of understanding that connects algebra and geometry to the mathematics of calculus. In basic terms, a limit is just a statement that tells you what height a function *INTENDS TO REACH* as you get close to a specific *x*-value. Recall from Pre-Calculus that you evaluated three types of limits. Complete the table below:

TYPE OF LIMIT	PROPER NOTATION	VERBALLY:
Right-hand limit	I'm fox) X->>C+	limit as xapproaches Cfrom the right.
Left-hand limit	limfor)	limit as x gpproaches C from the left
General limit	limf(X) X= C	limit as x Goorgannes C

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1. f(2)	2 (4) = 4
3. $\lim_{x \to 4^-} f(x) = 3$	4. $\lim_{x \to 2^+} f(x) =$
5. $\lim_{x \to 2^{-}} f(x) = -$	6. $\lim_{x \to -1^+} f(x) \sim \mathbf{A}$
7. $\lim_{x \to -1^{-}} f(x) = 2$	8. $\lim_{x \to -4^*} f(x) \neq 2$
9. $\lim_{x \to -4^-} f(x) dne$	10. $\lim_{x \to -1} f(x) = 2$
11. $\lim_{x \to 2} f(x)$ $dn \ell$	12. $\lim_{x \to 5} f(x) \simeq -2$
13. $\lim_{x \to \infty} f(x) \leq -1$	14. $\lim_{x \to -\infty} f(x) = -\infty$

Jul 2-8:27 AM

EX #2: THINK ABOUT THIS! If we think of the function as a highway, then the point at (2,-1)could be considered the end of the road, while the point at (-1,2) is more like a "pothole." How would you describe the points located at wort a barrier end bump in the road

Hopefully, this analogy gives you a visual reference for understanding limits from a graphical approach. Let's get a little more formal with our definition now.

When finding limits, ask yourself, "What is happening to y as x gets close to a certain number?" You are finding the **y-value** for which the function is approaching as x approaches c.

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LIMIT EXISTENCE THEOREM: lim fix exists if and only if х→с lim for = lim = L, where Lisa real number. x->c x->c+

<u>Verbally</u>: The limit as x approaches c on f(x) will exist if and only if the limit as x approaches c from the left is equal to the limit as x approaches c from the right.

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E	EX #6: Finding limits from a table of values										
No	Now consider the function $f(x) = \frac{x-3}{x^2+2x-15}$.										
Co	Complete the table below to find the limit as $x \rightarrow 3$.										
x	2.9	2.99	2.999	3	3.001	3.01	3.1				
f(x)	6.1266	1252	1250	Indet.	.12-19	.1248	.1235				
Bas belo	Based on your analysis, what are the values of each of the limits below?										
$\lim_{x \to 3}$	$\lim_{x \to 3^{-}} f(x) = , 12, 5$		$\lim_{x \to 3^+} f(x) = \sqrt{25}$			$\lim_{x \to 3} f(x) = .125$					

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