Friday, August 28, 2015
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Unit 1 Day 1
Limit Prop...

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Unit 1 Day 1 Limit Properties

Using your knowledge of limits, write your own Limit Existence Theorem in words and/or symbols:

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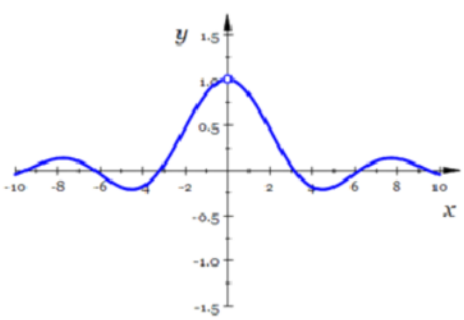
Limit Existence Theorem Verbally: The left limit = right limit.

Limit Existence Theorem Symbolically: $\lim_{x \to b^-} f(x) = \lim_{x \to b^+} f(x)$

Properties Table: If L, M, c, and k are real numbers and $\lim_{x\to c} f(x) = L$ and $\lim_{x\to c} g(x) = M$, then

Property Name	Algebraically	Verbally	Example
1. Sum Rule	$\lim_{x\to c}(f(x)+g(x)) = L+M$	The limit of the sums is the sum of the limits.	$\lim_{x\to 2} x^2 = 4$ $\lim_{x\to 2} x+1 = 3$ $\therefore \lim_{x\to 2} x^2+x+1 = 7$
2. Difference Rule	$\lim_{x\to c}(f(x)-g(x)) = L-M$	The limit of the difference is the diff of the limits.	$\lim_{x\to 2} x^2-(x+1) = 1$
3. Product Rule	$\lim_{x\to c}(f(x)\cdot g(x)) = L\cdot M$	The lim of the products is the product of the limits.	$\lim_{x\to 2} x^2\cdot(x+1) = 12$
4. Constant Multiple Rule	$\lim_{x\to c}(kf(x)) = kL$	The lim of a constant × a function is the cons. × the lim of the fxn.	$\lim_{x\to 2} 5x^2 = 20$
5. Quotient Rule	$\lim_{x\to c}\frac{f(x)}{g(x)} = \frac{L}{M}$	The limit of the quot. is the quotient of the limits	$\lim_{x\to 2}\frac{x^2}{x+1} = \frac{4}{3}$
6. Power Rule	$\lim_{x\to c}(f(x))^{r/s} = L^{r/s}$	The lim of a power of a function is the power of the lim of a fxn.	$\lim_{x\to 2}(x^2)^{2/5} = 4^{2/5}$
7. Constant Rule	$\lim_{x\to c}(k) = k$	The limit of a constant is a constant.	$\lim_{x\to 2} 5 = 5$

Limit to Memorize: $\lim_{x\to 0}\frac{\sin x}{x} = 1$



Practice:

Example 1: Given $\lim_{x \to a} f(x) = -3$ and $\lim_{x \to a} g(x) = 5$, find:

a. $\lim_{x \to a}(f(x) + g(x)) =$ $-3 + 5 = 2$

b. $\lim_{x \to a}(f(x) \cdot g(x)) =$ $-3 \cdot 5 = -15$

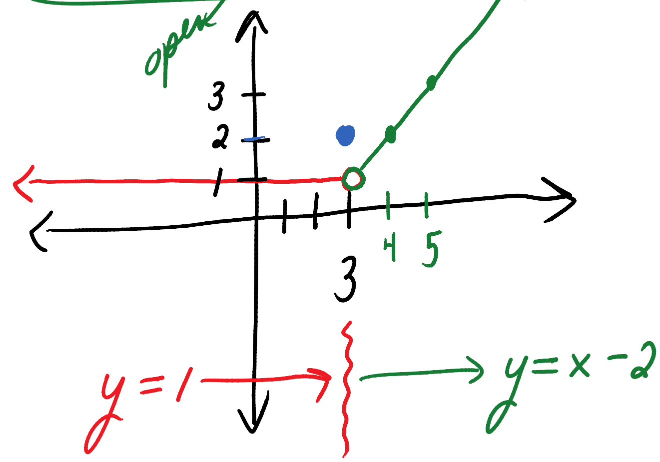
c. $\lim_{x \to a}(4f(x)) =$ $4 \cdot -3 = -12$

d. $\lim_{x \to a} 7 =$ 7

what where

Example 2: Graph and determine the following limits: $f(x) = \begin{cases} 1 & (-\infty, 3) \\ 2 & x = 3 \\ x - 2 & (3, \infty) \end{cases}$ open $(3, 2)$

open



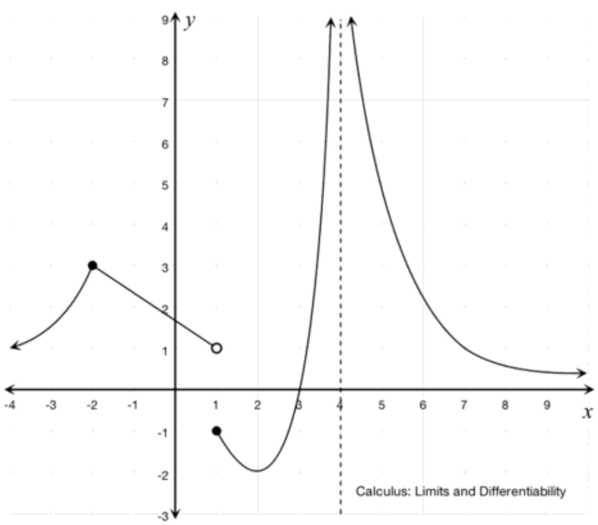
a. $\lim_{x \to 3^+} f(x) =$ 1

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

c. $\lim_{x \to 3} f(x) =$ 1

d. f(3) = 2

Example 3: Given this graph, where do limits exist for this function?



$\mathbb{R}, x \neq 1, 4$