Do Now: - Take a new hwk sheet from my desk

In your notes...

$$\lim_{x\to 4}\frac{x^2-16}{x-4} = \frac{(x+4)\cancel{(x-4)}^{1}}{\cancel{x-4}_{1}} \rightarrow \lim_{x\to 4}(x+4) = 4+4 = \boxed{8}$$

$4-4$
$=0$

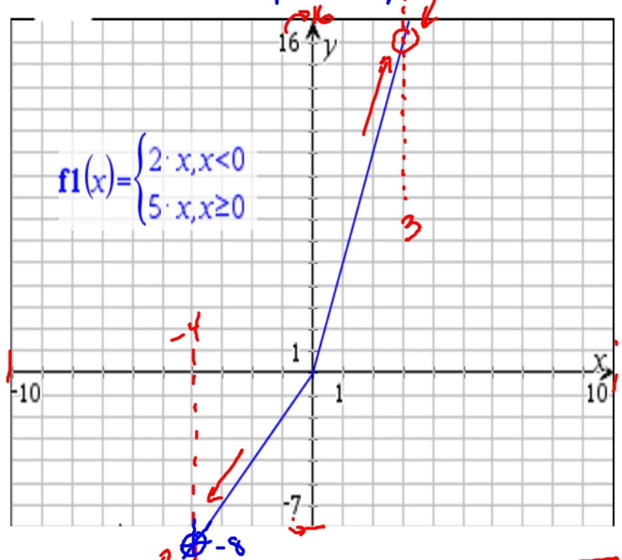
4/27/15

Aim: How do we find the limit of piecewise functions?

Limits of Piecewise Defined Functions

Ex. $f(x)=\begin{cases} 2x, x<0 & -1,-2,-3\ldots \Rightarrow \\ 5x, x\geq 0 & 0,1,2,3\ldots \end{cases}$

Graphically



a. Find:

f(3) = 5(3) = 15

f(-3) = 2(-3) = -6

f(0) = 5(0) = 0

b. Find $\lim_{x\to 3} f(x) = 15$

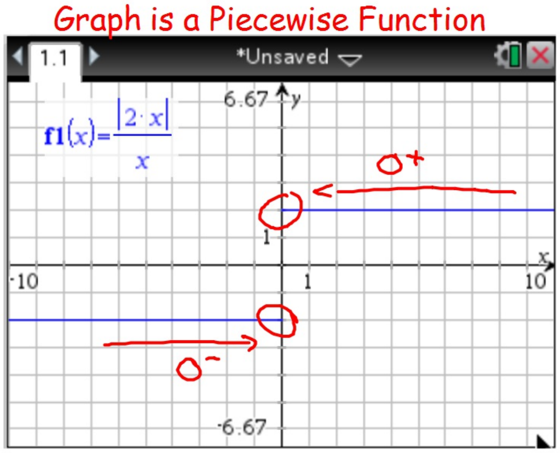
use 5x

c. Find $\lim_{x\to -4} f(x) = 2(-4) = \boxed{-8}$

Recall One Sided Limits...

Ex.: (a) $\lim_{x\to 0} \frac{|2x|}{x}$

Graph is a Piecewise Function



(i) $\lim_{x\to 0^-} \frac{|2x|}{x} = -2$

(ii) $\lim_{x\to 0^+} \frac{|2x|}{x} = 2$

(iii) $\lim_{x\to 0} \frac{|2x|}{x} =$ D.N.E. b/c (i) ≠ (ii)

(b) $f(x)=\begin{cases} 4-x, & x<1 \text{ ← left} \\ 4x-x^2, & x>1 \text{ ← right} \end{cases}$. Find $\lim_{x\to 1} f(x)$. $= \boxed{3}$

left

$\lim_{x\to 1^-} f(x) = \lim_{x\to 1} 4-x \to 4-1 = 3$

b/c left = right

$\lim_{x\to 1^+} f(x) = \lim_{x\to 1} 4x-x^2 \to 4(1)-1^2 = 4-1 = 3$

(c) Let $f(x)=\begin{cases} x-1, & x\leq 3 \text{ ← left } (-) \\ 3x-7, & x>3 \text{ ← right } (+) \end{cases}$

(i) $\lim_{x\to 3^-} f(x) =$ $x-1 = 3-1 = 2$

(ii) $\lim_{x\to 3^+} f(x) =$ $3x-7 = 3(3)-7 = 2$

(iii) $\lim_{x\to 3} f(x) = \boxed{2}$ b/c (i) = (ii)

(d) Let $g(t)=\begin{cases} t^2, & t\geq 0 \\ t-2, & t<0 \end{cases}$. Find:

right (+)

left (−)

(i) $\lim_{t\to 0^-} g(t)=$ $t-2 = 0-2 = \boxed{-2}$

(ii) $\lim_{t\to 0^+} g(t)=$ $t^2 = 0^2 = \boxed{0}$

(iii) $\lim_{t\to 0} g(t)=$ D.N.E. b/c (i) ≠ (ii)

(e) Find $\lim_{x\to 3} h(x)$ given that $h(x)=\begin{cases} x^2-2x+1, & x\neq 3 \\ 7, & x=3 \end{cases}$.

approaching from both sides of 3

$f(3) = 7$

$\lim_{x\to 3} h(x) \to \lim_{x\to 3} x^2-2x+1 \to 3^2-2(3)+1$

$= 9-6+1$

$= \boxed{4}$