Thursday, August 30, 2012 (Day 3)

Observe that the symbol $\lim_{x \to c} f(x) = L$

tells us that the graph of f appears to be heading for the location $(x, y) = (c, L)$

Another computational example

let $f(x) = \dfrac{x-11}{|x-11|}$

(A) find $f(11)$

Solution: $f(11) = \dfrac{11-11}{|11-11|} = \dfrac{0}{|0|} = \dfrac{0}{0}$ undefined

This tells us that graph of f has no y-value at $x = 11$.

(B) find $\lim_{x \to 11^-} f(x)$

(C) find $\lim_{x \to 11^+} f(x)$

(D) find $\lim_{x \to 11} f(x)$

Start by exploring $f(x)$ a bit. Come up with alternate way of writing $f(x)$

Plug in some x-values

x	y
0	$f(0) = \frac{0-11}{\lvert 0-11 \rvert} = \frac{-11}{\lvert -11 \rvert} = \frac{-11}{11} = -1$
9	$f(9) = \cdots\cdots = \frac{-2}{\lvert -2 \rvert} = \frac{-2}{2} = -1$
10	$f(10) = \frac{-1}{\lvert -1 \rvert} = \frac{-1}{1} = -1$
11	$f(11) = \frac{0}{0}$ = undefined
12	$f(12) = \frac{12-11}{\lvert 12-11 \rvert} = \frac{1}{\lvert 1 \rvert} = 1$
13	$f(13) = \frac{13-11}{\lvert 13-11 \rvert} = \frac{2}{\lvert 2 \rvert} = \frac{2}{2} = 1$

Conclude that

$f(x) = -1$ if $x < 11$

$f(x) =$ undefined if $x = 11$

$f(x) = 1$ if $x > 11$

So f is a "piecewise-defined function"

These are commonly abbreviated

$$f(x) = \begin{cases} -1 & \text{if } x < 11 \\ \text{undefined} & \text{if } x = 11 \\ 1 & \text{if } x > 11 \end{cases}$$