2.1 Stuff -

The calculator skills I used were meant to *save time* on the tedious parts of 2.1, but MIGHT have just slowed you down, when you weren't sure what I was doing.

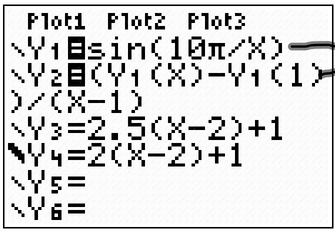
Those who came in for 1-on-1 figured it out, quickly.

The point of 2.1 was to get a numerical take on limits, and discover some of the problems that can arise with a numerical approach to sometimes slippery limits. Functions that oscillate rapidly are especially troublesome.

2.2 Stuff -

A graphical/visual approach to limits.

2.3 - Some rules to help us in practice.



2.1 #9

$f(x)$

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

Approaching x by tenths:

.6, .7, .8, .9 from left

1.4, 1.3, 1.2, 1.1 from right

doesn't get close enough to $a=1$ to come very close to m_{tan}.

Y_2 spits out the m_{sec}'s, just by entering

$x=.6$, $x=.7$, ...

This one *is* assigned. The "as in Example 9" is important. This is a kind of reasoning that's very useful, but hard to master, at first.

33. Determine $\lim_{x\to 1^-} \dfrac{1}{x^3-1}$ and $\lim_{x\to 1^+} \dfrac{1}{x^3-1}$

(a) by evaluating $f(x) = 1/(x^3-1)$ for values of x that approach 1 from the left and from the right,

(b) by reasoning as in Example 9, and

(c) from a graph of f.

(a) $\dfrac{1}{(.9)^3-1}$, $\dfrac{1}{(.999)^3-1}$, from left

(b) $\dfrac{1}{\text{small neg}}$ from left $-$BIG

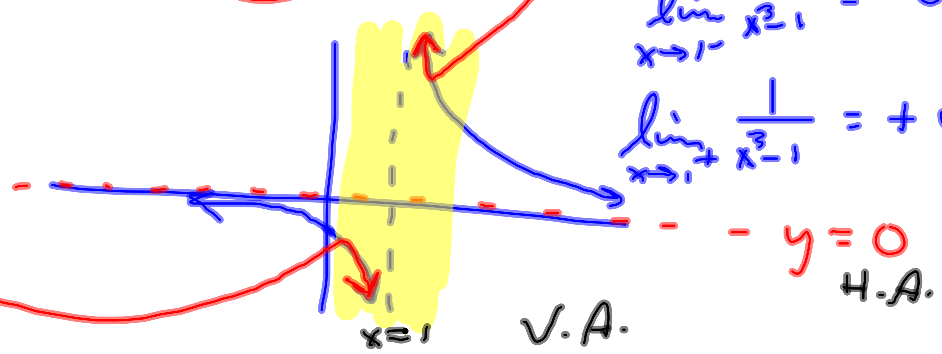
$\dfrac{1}{(1.0001)^3-1}$, from right

$\dfrac{1}{\text{small pos}}$ from right $+$BIG

$\lim_{x\to 1^-} \dfrac{1}{x^3-1} = -\infty$

(c)

$\lim_{x\to 1^+} \dfrac{1}{x^3-1} = +\infty$



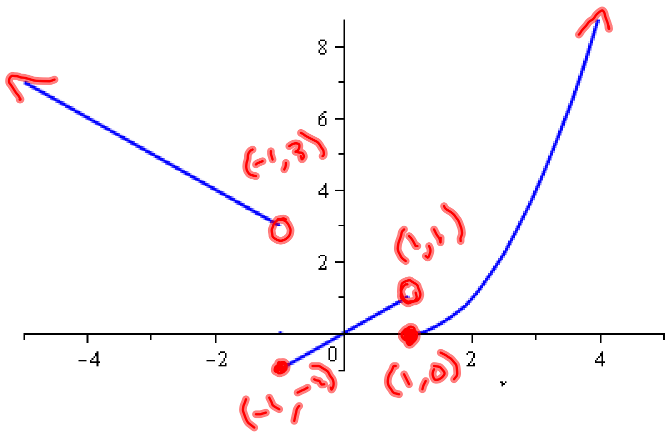
12. Sketch the graph of the following function and use it to determine the values of a for which $\lim_{x\to a} f(x)$ exists:

$$f(x) = \begin{cases} 2 - x & \text{if } x < -1 \\ x & \text{if } -1 \leqslant x < 1 \\ (x-1)^2 & \text{if } x \geqslant 1 \end{cases}$$

$\mathbb{R} \setminus \{-1, 1\}$

You want to be sure to have a general idea of what each piece looks like *and* make *certain* you "sew the pieces together" by checking the boundary values between pieces. (The suture points)

$2-(-1)=3$



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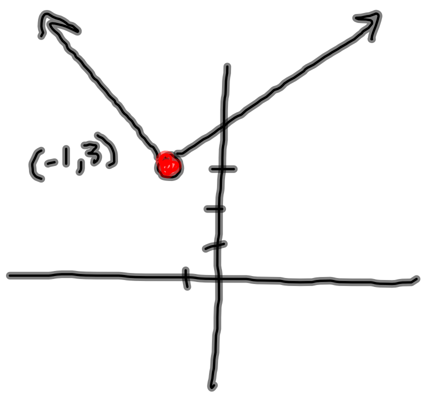
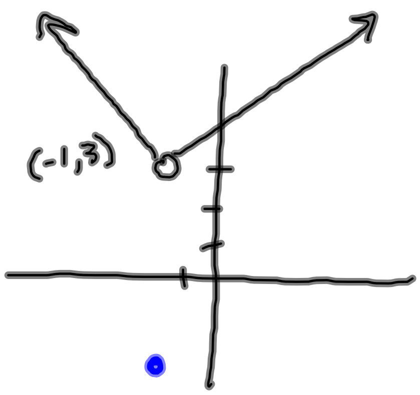
$$f(x)=\begin{cases} 2-x & \text{if } x<-1 \\ x+4 & \text{if } x\geq -1 \end{cases}$$



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

does exist at $x=-1$, because the two pieces happen to meet.

$$f(x)=\begin{cases} 2-x & \text{if } x<-1 \\ x+4 & \text{if } x>-1 \end{cases}$$



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