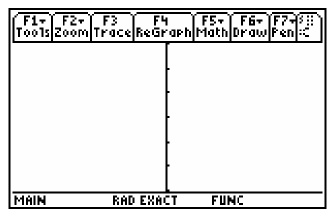
Assignment 5: Limits, Part 1 (1.2) **Name____________________**
Please provide a handwritten response.

1a. Many ordinary limits can be found with the TI-89 and the Voyage 200 using the **limit** command. For example, to evaluate $\lim\limits_{x\to -3} \frac{3x+9}{x^2-9}$ you can execute the command $\mathit{limit}\left(\left(3x+9\right)/\left(x \wedge 2-9\right),x,-3\right)$. Execute this limit and record the result below.

1b. Your text suggests that $\lim\limits_{x\to 0} \frac{\sin x}{x} = 1$. Execute $\mathit{limit}\left(\sin\left(x\right)/x, x, 0\right)$ and record your result below. Does it agree with your text?

2a. You are asked for numerical and graphical evidence regarding $\lim\limits_{x\to 0} \frac{\tan x}{\sin x}$. Graph $y = \frac{\tan x}{\sin x}$ on the axes below. What value for $\lim\limits_{x\to 0} \frac{\tan x}{\sin x}$ does this graph suggest?



$-\frac{\pi}{4} \le x \le \frac{\pi}{4}, .9 \le y \le 1.5$

2b. Next, evaluate $f\left(-0.1\right)$, $f\left(-0.01\right)$, etc. to complete the table below. What value for $\lim\limits_{x\to 0} \frac{\tan x}{\sin x}$ does the table suggest?

x	$f(x)$
-0.1	
-0.01	
-0.001	
0.001	
0.01	
0.1	

2c. Finally, evaluate $\mathit{limit}\left(\tan\left(x\right)/\sin\left(x\right), x, 0\right)$ and record the result below. Did all three approaches lead you to the same conclusion?

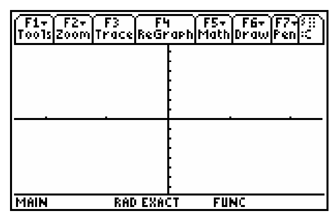
3a. The example $\lim_{x \to 0} \frac{\cos x - 1}{x^2}$ shows that round-off error can cause very misleading computed results. Enter $y = \frac{\cos x - 1}{x^2}$ and complete the table below. (Be sure to count the zeros). Then evaluate $\textbf{limit}((\cos(x)-1)/x \wedge 2, x, 0)$ and record the result below.

x	$f(x)$
0.1	
0.0001	
0.0000001	
0.00000001	
0.000000001	

3b. Do you think that all of your calculator's results are correct in part a? If not, then which one(s) do you think are wrong, and why?

4a. To find one-sided limits you give the direction in the **limit** command by inserting **–1** for the limit from the left. Graph the function $g(x) = \frac{x}{|x|}$ on the axes provided below.

Evaluate $\lim_{x \to 0^-} \frac{x}{|x|} = \textbf{limit}(x / abs(x), x, 0, -1)$ and record the result below.



$-2.5 \le x \le 2.5, -1.5 \le y \le 1.5$

4b. Now evaluate $\lim_{x \to 0^+} \frac{x}{|x|} = \textbf{limit}(x / abs(x), x, 0, 1)$ and record the result below.

4c. Now evaluate $\lim_{x \to 0} \frac{x}{|x|} = \textbf{limit}(x / abs(x), x, 0)$. Did you expect this result? Why?