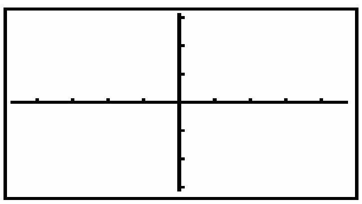
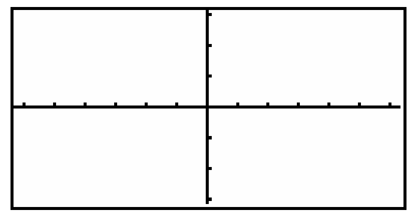
Assignment 5: Limits, Part 1 (1.2) **Name____________________**
Please provide a handwritten response.

1a. The TI-83 Plus/TI-84 Plus and TI-86 can be used to conjecture values for limits both graphically and numerically. To conjecture $\lim_{x \to -3} \frac{3x+9}{x^2-9}$ you first graph $y = \frac{3x+9}{x^2-9}$ on a standard window. Change to **ZOOM ZDECIMAL** and use the trace feature on the calculator to approach –3 from either direction. Note that the function is undefined at $x = -3$. Why? As you approach –3, what y-value are you approaching? That value is your conjecture. Is the vertical line at $x = 3$ (in the standard window) part of the graph? Why or why not? Record your results and graph below.



$-4.7 \le x \le 4.7, -3.1 \le y \le 3.1$

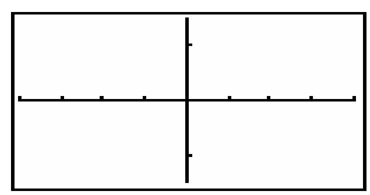
TI-83 Plus/TI-84 Plus



$-6.3 \le x \le 6.3, -3.1 \le y \le 3.1$

TI-86

1b. Your text suggests that $\lim_{x \to 0} \frac{\sin x}{x} = 1$. Graph $y = \frac{\sin x}{x}$ and trace to $x = 0$ from either side. Does the graph support the conjecture made in the text? Record your results and graph below.

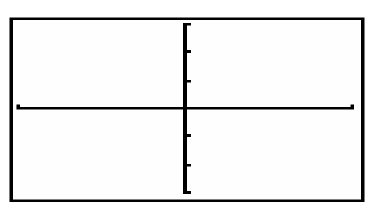


$-2\pi \le x \le 2\pi, -1.5 \le y \le 1.5$

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

2b. Next, evaluate $f(0.1)$, $f(0.01)$, etc. to complete the table below. What value for $\lim_{x \to 0} \frac{\tan x}{\sin x}$ does the table suggest? Do these approaches lead you to the same conclusion?

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



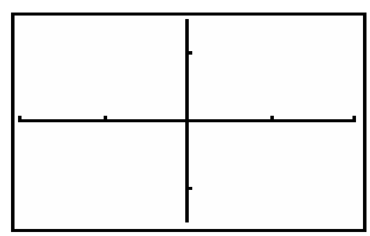
$\frac{-\pi}{2} \le x \le \frac{\pi}{2}, -3 \le y \le 3$

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).

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

3b. Examine the graph of $y = \frac{\cos x - 1}{x^2}$. 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 need to trace your graph from the appropriate side of the value being approached. Graph $y = \frac{x}{|x|}$. Enter this as $y = x / abs(x)$. Sketch the result on the axes below. Now estimate $\lim_{x \to 0^-} \frac{x}{|x|}$ by tracing. (Place the cursor to the left of 0 and trace towards 0. Box and repeat the tracing if necessary). Record the result below.



$-2 \le x \le 2, -1.5 \le y \le 1.5$

4b. Now estimate $\lim_{x \to 0^+} \frac{x}{|x|}$ by placing the cursor to the right of 0 and tracing towards 0. Box and repeat tracing if necessary. Record your result below.

4c. Do your results show that $\lim_{x \to 0} \frac{x}{|x|}$ exists? Why?