Special Limits

According to the Standards:

Instructional programs from preK-grade 12 should enable students to:

- Recognize and use connections among mathematical ideas
- Use the language of mathematics to express mathematical ideas precisely
- Compute fluently and make reasonable estimates

In grades 9-12 students should

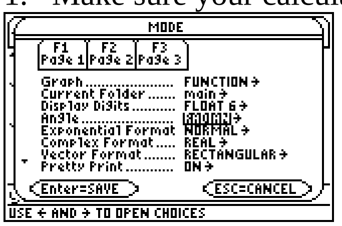
- Students should develop an increased capacity to link mathematical ideas and a deeper understanding of how more than one approach to the same problem can lead to equivalent results.
- Judge the reasonableness of numerical computations and their results

This activity will have the TI-89 demonstrate the use of the difference quotient as the definition of the derivative.

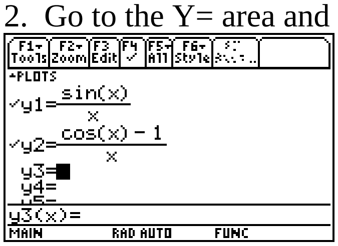
Objective: To establish the special limits for $f(x) = \dfrac{Sin(x)}{x}$ and $g(x) = \dfrac{Cos(x) - 1}{x}$

As the value of x approaches 0.

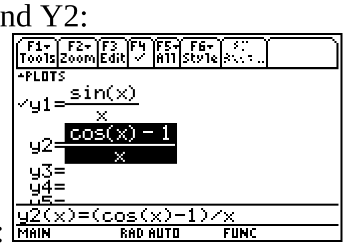
1. Make sure your calculator is in *radian* mode (press MODE)



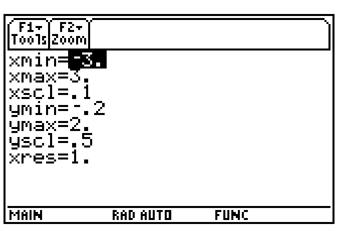
2. Go to the Y= area and input the two functions in Y1 and Y2:

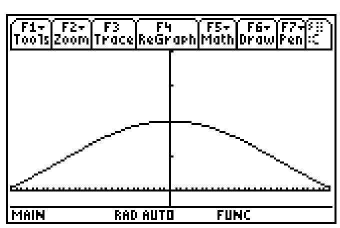


deactivate Y2 by pressing F4:

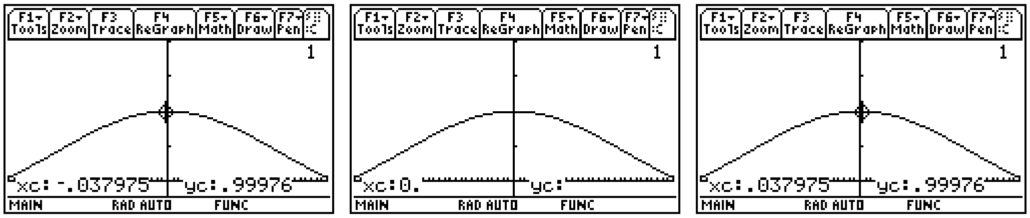


2. Let's look at the graph of Y1 in a small neighborhood around x = 0



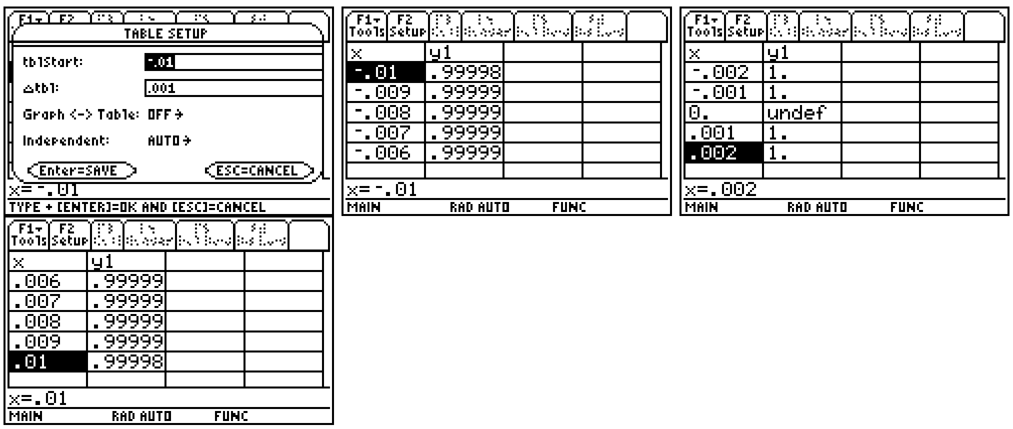


3. Press TRACE (F3), look at the values it reports to the left & right of 0 and at 0.

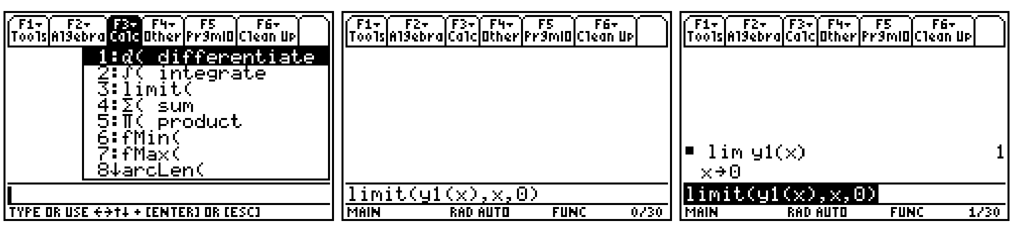


4. Set Up a table in a very small neighborhood of 0 and examine the results:

(Diamond – F4 will take you to the Table Set up)
Be sure to hit ENTER after you put your set up values in or they will not be registered



5. Let the TI-89 actually get the limit: (Limit is found in F3-CALC)
You need to input the function, the variable, the approaching value)



Aside: you can prove this limit using the Squeeze Principle

TRY THIS:

Now go back and deactive Y1, activate Y2 and go through the same steps to establish the limit for $g(x) = \dfrac{Cos(x) - 1}{x}$ as *x* approaches zero.

Answer to Try This:

Limit as *x* approaches 0 of $g(x)=\dfrac{Cos(x)-1}{x}$ = **0**

Here's how the screens should look: