

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

**In grades 9-12 students should**

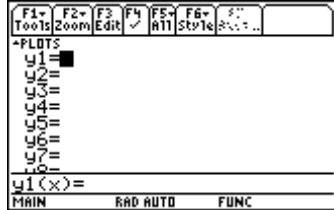
- Students should develop an increased capacity to link mathematical ideas and a deeper understanding of how more than one approach to the same problem can lead to equivalent results.

**Calculus Scope and Sequence: Derivatives**

**Keywords:** quotient rule

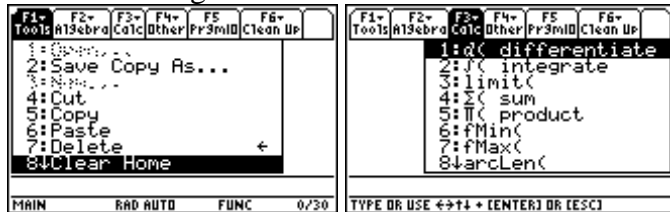
**Description:** This activity will use the capabilities of the TI-89 to illustrate the symbolic derivative quotient rule.

1. Go to the Y= screen and make sure Y1 and Y2 are empty, we are going to use them both as variables and as function definitions.

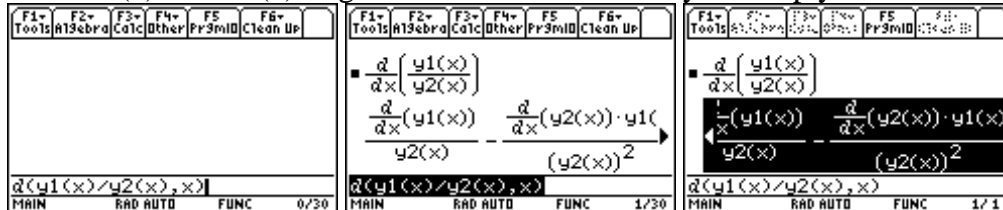


2. Press HOME and go back to the HOME screen (if it's not black press Clear, then F1-8)

3. Press F3 to get the Calculus Menu. Item #1 is the derivative key



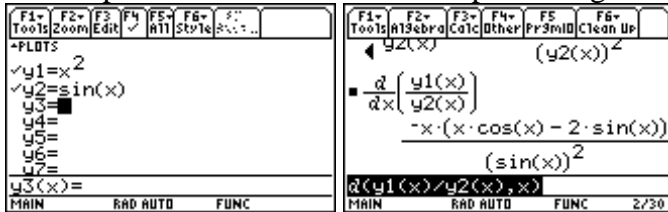
4. The syntax for using the derivative key is:  $d(\text{function}, \text{variable})$  so we are going to enter Y1(x) and Y2(x) as generic functions since they are empty:



(Use Up Arrow-Right Arrow to scroll for the full result)

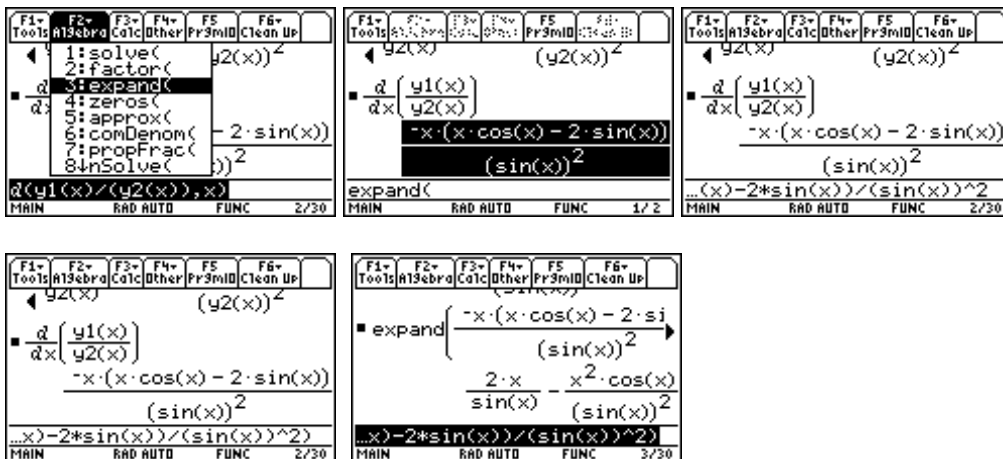
**Question:** if the quotient rule is:  $\frac{der(top) * bottom - der(bottom) * top}{bottom^2}$ , why is there only a square term in the second fraction?

5. Go Back to the Y= screen and let  $y_1 = x^2$  and  $y_2 = \sin(x)$   
 Then go back to the HOME screen  
 Set up and execute the derivative process again



In this case, the TI-89 shows a simplified result, if you want to see the expanded answer (which would give you a hint to the question asked above) then use the following steps:

- Go to F2-Algebra
- Select Expand
- Use the UP Arrow to highlight the result and press ENTER
- Make sure to close the parentheses [ you'll have to add the “)” on the end]
- Press ENTER



**\*\*Answer to Question!!!!\*\* The TI-89 When simplifying takes the expression and distributes the denominator as it breaks up the fraction.**