

The Definition of Derivative:

According to the Standards:

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

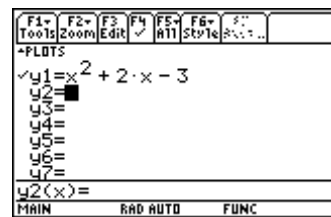
- Recognize and use connections among mathematical ideas
- Use the language of mathematics to express mathematical ideas precisely

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.

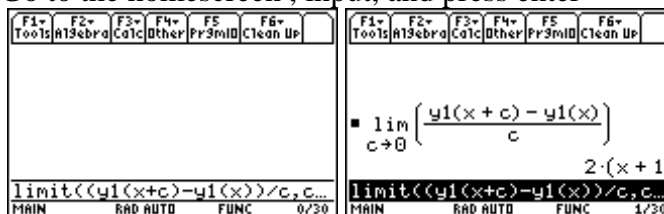
This activity will have the TI-89 demonstrate the use of the difference quotient as the definition of the derivative.

Objective: Establish $\lim_{c \rightarrow 0} \frac{f(x+c) - f(x)}{c} = f'(x)$ as the same as the shortcut symbolic derivatives.



1. Go to the Y= screen and input $y1 = x^2 + 2x - 3$
2. The Limit command is found in the F3: Calc Menu. You need the function, variable, value it approaches so $\lim_{c \rightarrow 0} \frac{y1(x+c) - y1(x)}{c}$ would be entered as:
 $\text{lim}((y1(x+c)-y1(x))/c,c,0)$

3. Go to the homescreen , input, and press enter

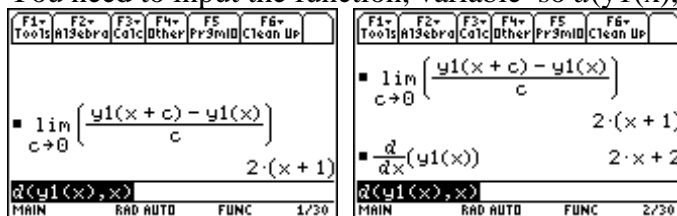


4. Go back to the homescreen and let the TI-89 do the derivative



5. The derivative is also found in F3: CALC

6. You need to input the function, variable so $d(y1(x),x)$, then press enter:



What you'll see on the screen in front of you are both results, in slightly different but equivalent forms.

Try This:

Go back to Y= window and change the expression in Y1, then reevaluate whatever expression you choose to put in using both the limit definition and then the command generated derivative. You should see the same results:

1. $\sin(x)$
2. e^{2x}
3. $\ln(3x-2)$

Answers to Try This:

All work exactly as they should: 1: $\cos(x)$ 2: $2e^{2x}$ 3: $1/x$

Interesting note: If you use the ALPHA-E instead of the Diamond-X to get to euler's function the results will also include $\ln(e)$ in the answer.