According to the Standards:

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

- Recognize and use connections among mathematical ideas
- Make and investigate mathematical conjectures

**In grades 9-12 students should**

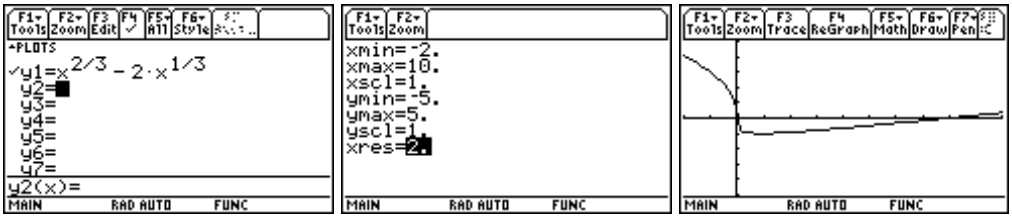
1. Students should develop an increased capacity to link mathematical ideas and a deeper understanding of how more than one approach to the same problem can lead to equivalent results.

**Calculus Scope and Sequence:** Applications of Derivatives
**Keywords:** Rolle, Rolle's theorem
**Description:** This activity will illustrate Rolle's Theorem

*Rolle's Theorem: If f, is a function continuous over a closed interval [a,b] , differentiable on the open interval (a,b) and f(a)=f(b)=0, Then there is at least one value of c, in (a,b) such that f'(x)=0*

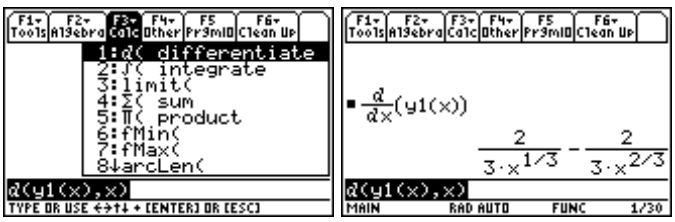
Determine whether or not the hypothesis of Rolle's Theorem holds on the following function: $f(x) = x^{\frac{2}{3}} - 2x^{\frac{1}{3}}$ for [0,8]

1. First input the function into Y= and observe it's graph over the interval (it's always a good idea to set the window a bit larger than the interval to observe behavior around the endpoints)




2. While the function is continuous it would also be good to look at the derivative:

- Go to the Homescreen (Press HOME)
- Go to F3-Calc-#1
- Calculate the derivative function

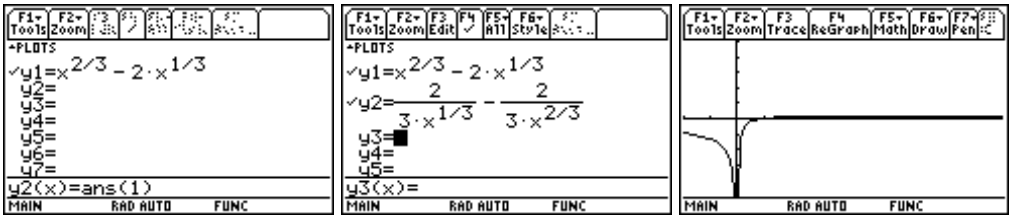


3. This can be entered into the Y= menu as follows

- Go to Y=, choose an empty slot (y2 in this case)
- Press 2nd-Ans then ENTER

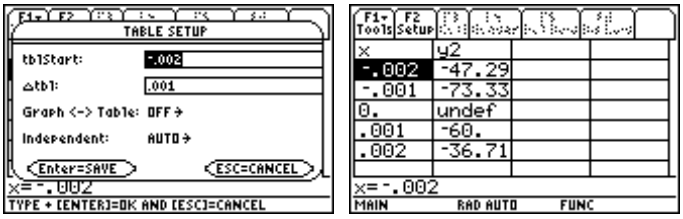
That will paste the exact result into the proper slot

- Look at the graph



It would appear that the derivative might be undefined at $x = 0$ let's look at the table for confirmation:

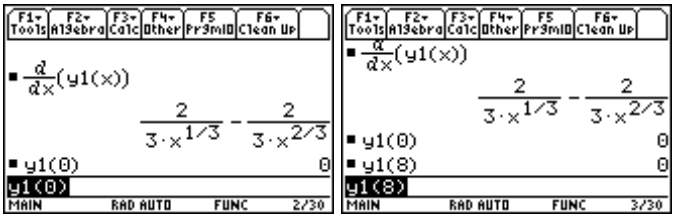
- Go to TableSet and set the values in a small neighborhood of 0
- Look at the TABLE



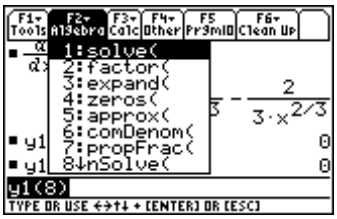
Since Rolle's Theorem says it must be differentiable on the open interval we have satisfied the entry points. So, now let's see if the rest of the condition applies:

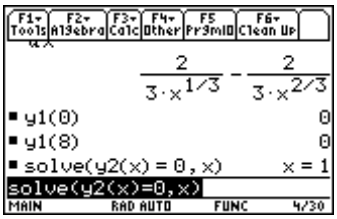
- Calculate y1(0)
- Calculate y1(8)
- If they are both = 0, then find a value where the derivative (here in y2(x)) is = 0

All this can be done on the Homescreen:



- To Solve we go to F2-Algebra #1 and enter the following arguments:
  - (function = 0, variable)
- In this case the derivative function we are using is in y2(x)




Therefore, we have confirmed Rolle's theorem for this example.