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.

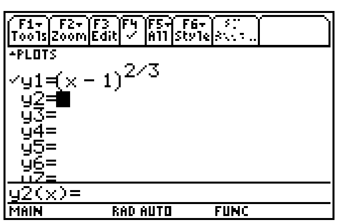
Calculus Scope and Sequence: Applications of Derivatives
Keywords: maximum, minimum, inflection, critical points
Description: This activity will involve analyzing a function for its critical values

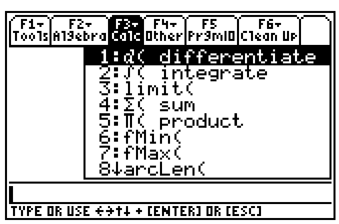
Find the critical numbers of $f(x) = (x-1)^{2/3}$ *and determine whether they yield relative maxima, relative minima, or inflection points*

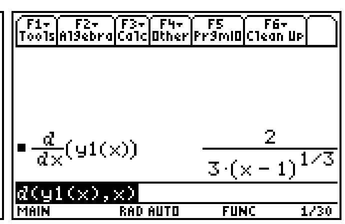
1. Go to the Y= screen and store the function in y1
2. Take the derivative of the function and find the roots and where, if at all, the derivative is undefined
3. Test values on either side of these points to determine max, min, inflection

Note: the derivative is found in F3-Calc-#1 and requires the following syntax:
d(function, variable).

Use tip: When you input the function. Be sure that (2/3) is enclosed otherwise it will follow the order of operations and give you something you don't want.

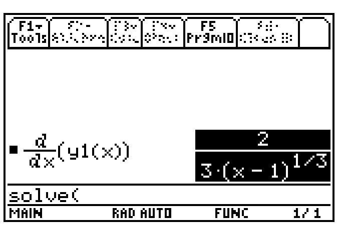


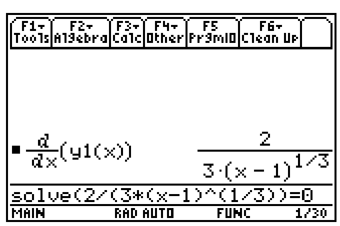


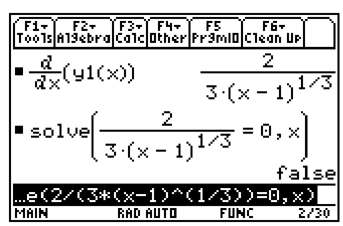


Setting the answer equal to zero: Use the SOLVE command found in F2-Algebra-#1 requiring the following syntax: solve(function=value, variable)

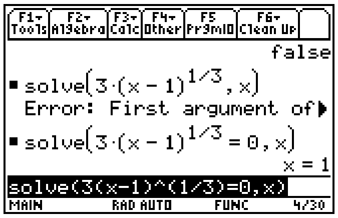
User tip: You can copy the answer you just found to the command by using the Up Arrow to highlight it and press enter







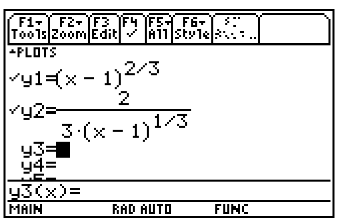
This confirms that there is no real value for which the derivative is zero, however, there is a value for which the derivative is undefined.
Set the denominator equal to zero and solve:

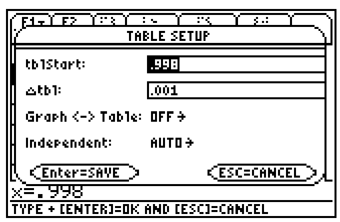


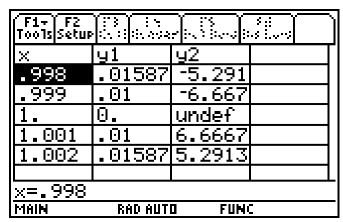
Now we need to test points for the behavior of the slope in a small neighborhood of x =1
We can do that by:

- Storing the derivative in y2
- Setting up a table with values close to 1
- Examining the behavior of the slope

User tip: You can go up to the original derivative, use F1-Copy and then go to Y=, and while on y2(x) you can use F1-Paste to avoid entry errors







You can see from the table that the slope (values of y2) goes from negative to positive, thus creating a ***minimum***. You can also see from the table that the actual point at which that happens is (1,0) (from the value of y1).

You can confirm its appearance as a cusp, by graphing the original function.