TI-nspire™

Grade level: 9-12
Subject: math
Time required: 45 to 90 minutes

Derivatives with Piece-Wise Defined Functions

by – Matt Bohon

Activity overview

Piece-wise defined functions are used extensively in PreCalculus and Calculus. This concept will be used to teach and demonstrate differentiation. Students will engage in a discovery activity using the TI-Nspire. Students will take the derivative at a particular point as well as calculate the derivative as a function.

Concepts

- *Piece-wise defined functions*
- *Derivative*
- *Differentiability*

Teacher preparation

Students should have a firm grasp of graphing many types of functions. Also general knowledge of the TI-nspire is required. Graphing and/or defining piece-wise defined functions is a definite prerequisite.

Classroom management tips

This activity will be primarily student driven. Students could work in groups to complete the attached activity sheet. Be sure students understand these concepts numerically, graphically, and algebraically. The example demonstrated in the step-by-step directions would be a great first example to be led by the teacher using either a TI-Nspire or the TI-Nspire computer software.

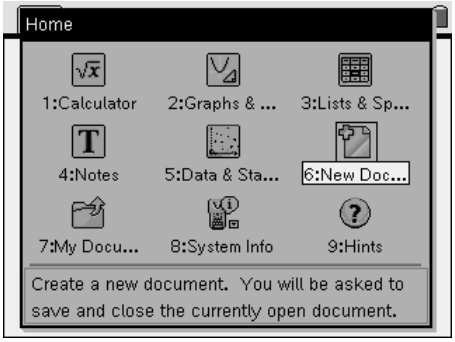
TI-Nspire Applications

Graphs & Geometry, Calculator

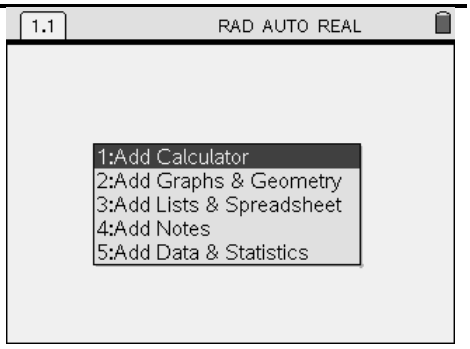
Step-by-step directions

These instructions are for the first exercise. Similar steps can be used to solve the remaining problems.

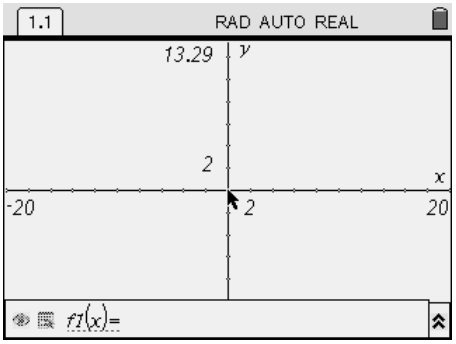
Press (home) *, taking you to the home screen.*



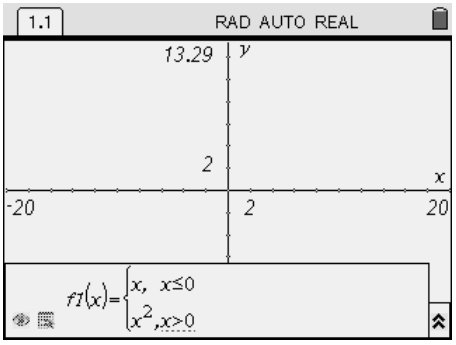
Press 6 *for a New Document. You may be Asked if you want to save this document. Answer 'NO' to move on.*

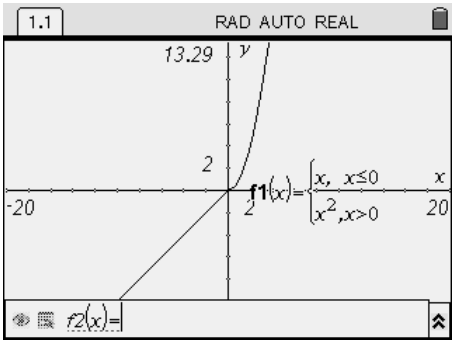


Type 2 *to add 'Graphs and Geometry'.*



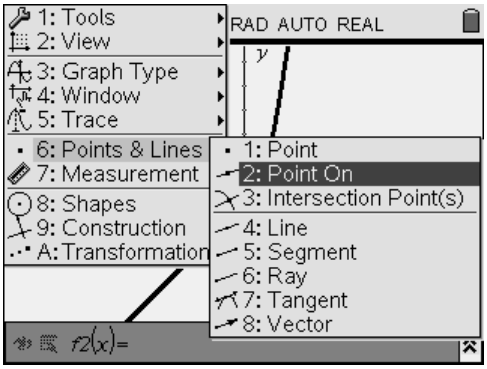
Enter the function definition from Exercise 1 on the student worksheet. Then press enter to graph it.

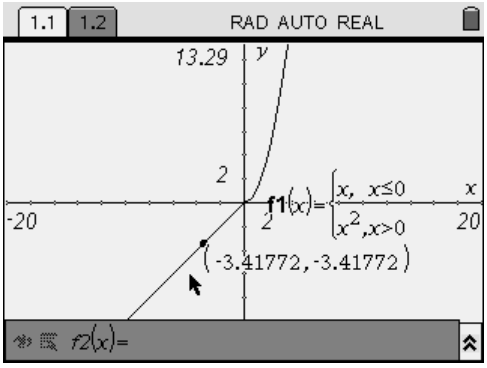




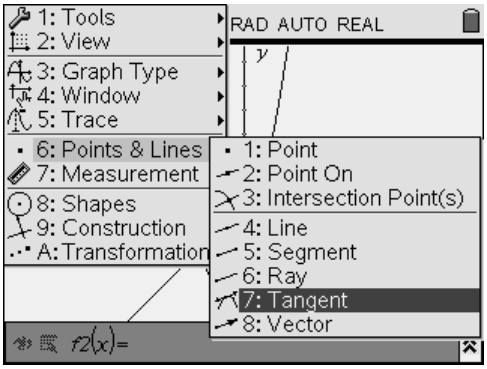
One way to find the value of the derivative graphically would be the following:

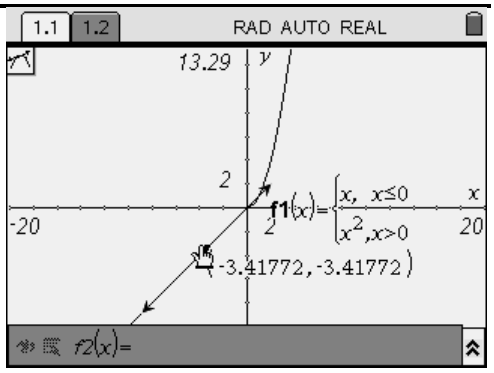
Place a point on the graph using menu 6 2. *Press* enter *to put the point on the graph.* esc *out of that tool.*



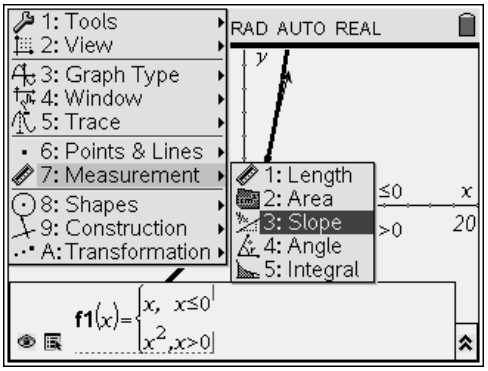


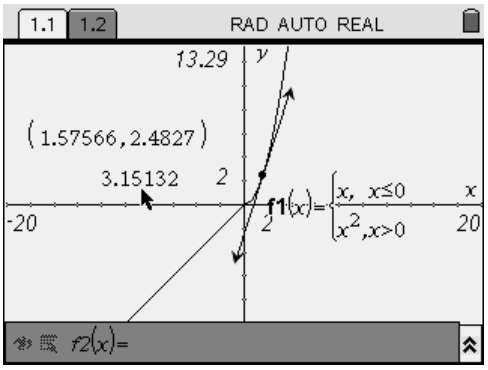
menu 6 7 *will place a tangent line at the point you created above. Make sure the point blinks when you select it*



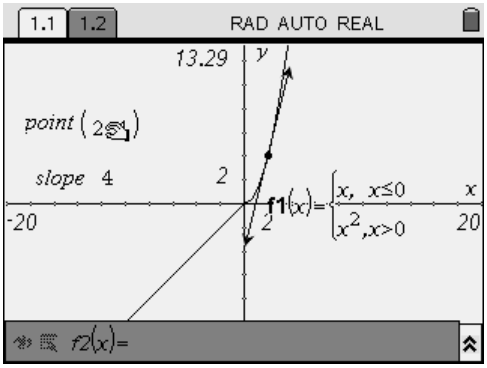


From the measurement menu select the slope tool to measure the slope of the tangent line. Press menu 7 3

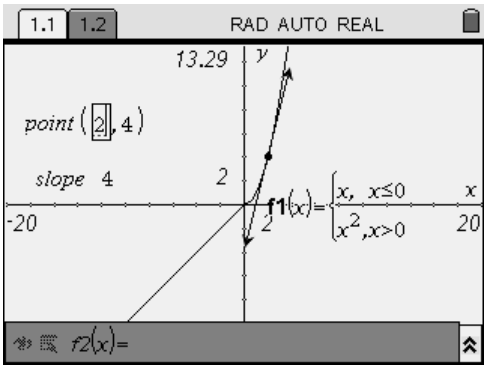


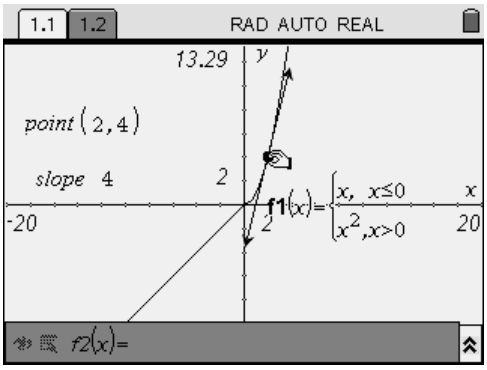


Use the text tool to label these point and the value of the derivative. Also it may be helpful to move these values out of the way of the original equation.

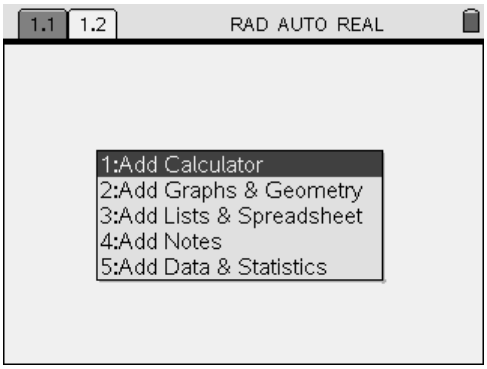


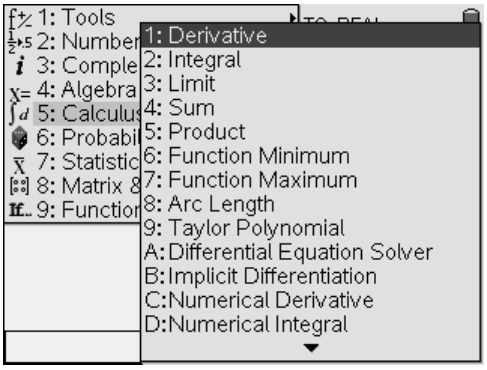
The x-value of the point can be changed by clicking on it or by dragging the point with the grab hand .



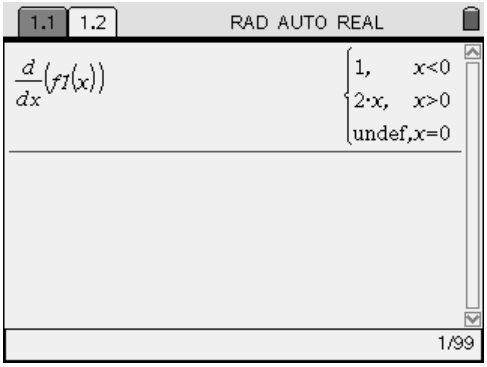


The derivative can also be calculated algebraically. Open a new Calculator window and then from the Calculus menu we can calculate a derivative. Press (menu) (5) (1).

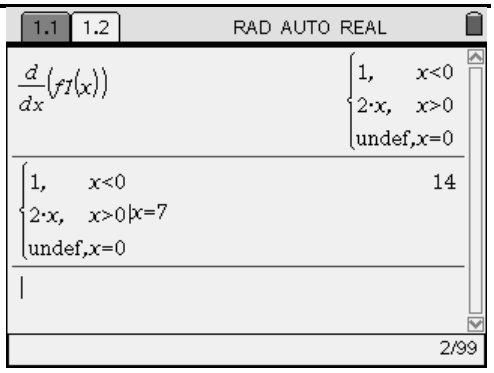




Then it is a simple step to fill in the squares properly. Use (tab) *to cycle between the empty squares*



The derivative expression can then be evaluated using the 'With' command (|). The expression will show where the derivative is undefined.



Assessment and evaluation

- *Successful completion of the attached worksheet.*
- *Teachers may limit questions to more easily understood equations.*

Activity extensions

- *Students could graph the derivative equations calculated.*
- *Data could be captured from the slope of the tangent line and/or the x-coordinate into a list for analysis*