Integration with Piece-Wise Defined Functions

by – Matt Bohon

Activity overview

Piece-wise defined functions are used extensively in PreCalculus and Calculus. Students will learn how to calculate values of definite and indefinite integrals using the TI-Nspire CAS.

Concepts

- *Piece-wise defined functions*
- *Integral*
- *Integration*
- *Antiderivatives*

Teacher preparation

Students should have a firm grasp of graphing many types of functions. Also general knowledge of the TI-nspire is required. This activity could be used in a Calculus course prior to an extensive study of integration. Some knowledge of the process by students would be beneficial.

Classroom management tips

This activity will be primarily student driven. Students could work in groups to complete the attached activity sheet. The teacher can work through the given example, which is problem number one from the worksheet.

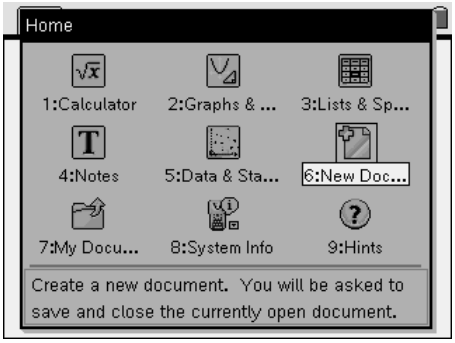
TI-Nspire Applications

Graphs & Geometry, Calculator

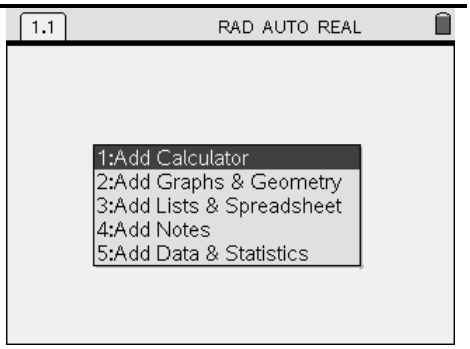
Step-by-step directions

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

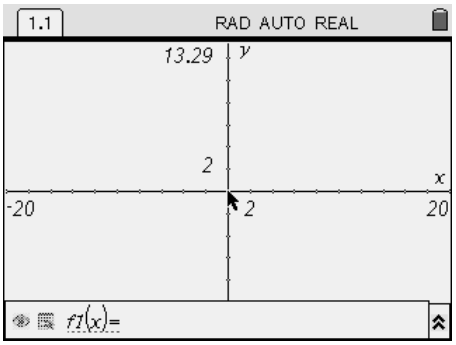
Press (home) *, taking you to the home screen.*



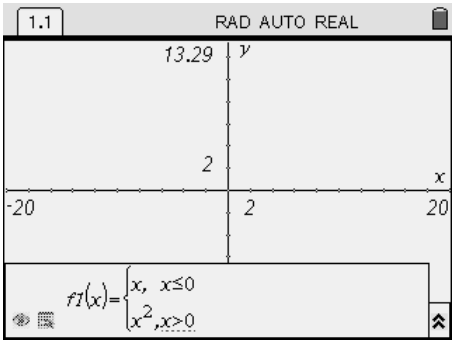
Press 6 *for a New Document. You may be Asked if you want to save this document. Answer 'NO' to move on.*

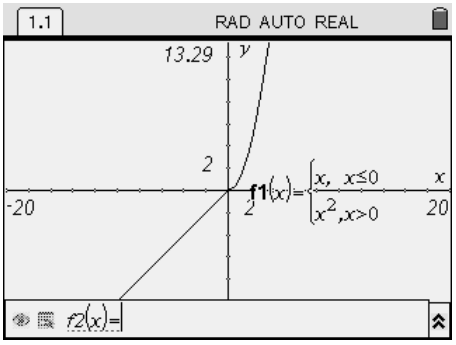


Type 2 *to add 'Graphs and Geometry'.*

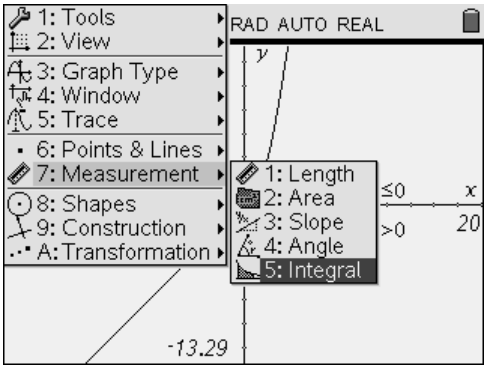


Enter the functions definition from Exercise 1 on the student worksheet. Then press enter to graph it.



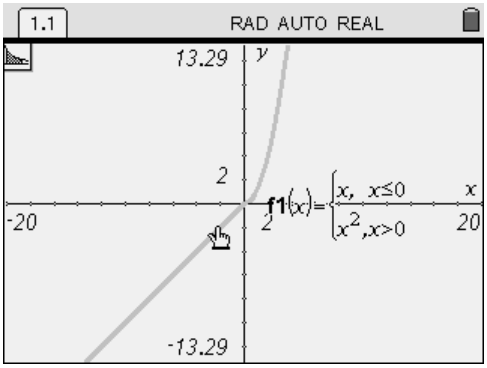


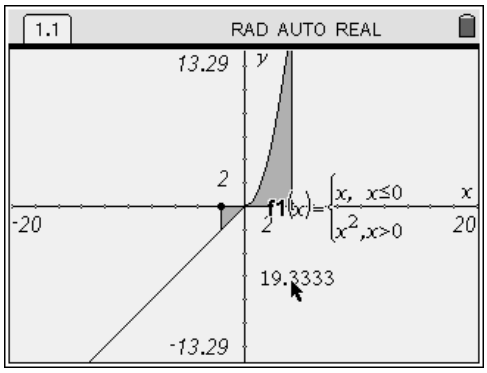
To calculate an integral geometrically on the graph screen press (menu) (7) (5) *to invoke the Integral tool.*



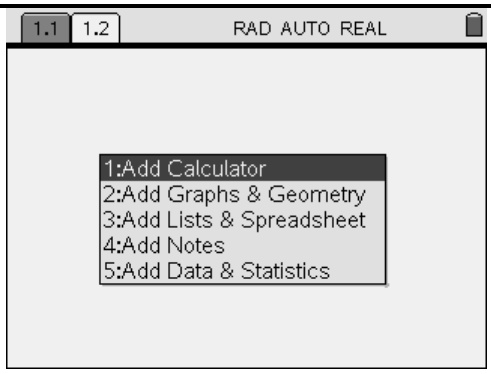
Press (enter) *to select which graph you are integrating(if in fact there are multiple graphs displayed).. You will then have to press* (enter) *to select the lower bound and press* (enter) *again to select the upper bound of integration. Alternately you can type in numerical values for each of these bounds*

It may be beneficial to move the value of the integral so that it can be easily read..

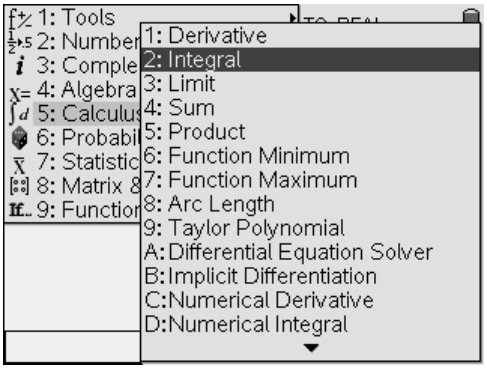


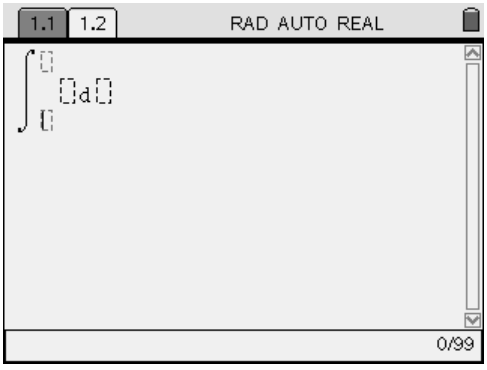


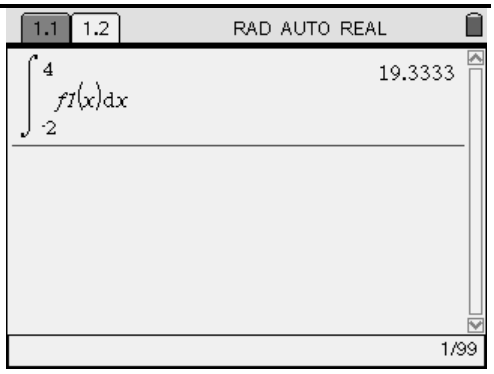
Alternately, the definite integral can be calculated in the Calculator application.



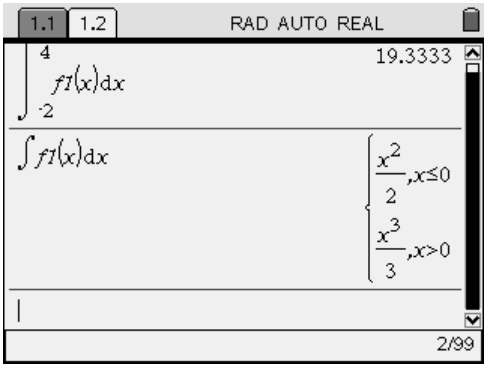
Press (menu) (5) (2) *to invoke the integral tool. Fill in these blanks to get the same answer as above in the Graphs and Geometry Application.*







For an indefinite integral, just leave the limits of integration blank. The piece-wise indefinite integral will be calculated.



Assessment and evaluation

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

Activity extensions

- *The methods discussed in this activity will work for more simple functions (i.e. non – piece-wise defined). However, a piece-wise function with more than two parts is not as easily calculated. Doing a function involving more than two parts would be an excellent extension.*
- *The limits of integration in the Graphs and Geometry application may be dragged and new areas calculated. These new values could be captured and placed in a table for further analysis.*