What is Calculus?

ID: 12726

Time Required
20 minutes

Activity Overview

Students will explore the major concepts of calculus. Students will answer questions and investigate animations in this introduction and overview of calculus. Students will get the big picture of what calculus is about and its various applications.

Topic: Introduction and Overview of Calculus

- *Introduce concepts of limit, derivative and integral.*
- *Brief historical background of calculus and its application.*

Teacher Preparation and Notes

- *This activity is designed to be a student-centered activity to begin the year of calculus. It can also be used toward the end of the year in precalculus as a preview for what is to come next year. Teachers could also use the animations with their ViewScreen™ to introduce the key concepts of calculus.*
- *The TI group file* WhatIsCalculus.tig *contains a program and the files that are necessary to make the program run properly. Use the TI-Connect or TI-Navigator software to send the group file to students' graphing calculators. By using the calculator-to-calculator connecting cable, the files can also be quickly and easily distributed to the entire class.*
- ***To download the group file and student worksheet, go to education.ti.com/exchange and enter "12726" in the keyword search box.***

Associated Materials

- *WhatIsCalculus_Student.doc*
- *WhatIsCalculus.tig*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Local Linearity Discovery (TI-Nspire technology) — 10890*
- *Calculus and the TI-89 (TI-89 Titanium) — 3210*
- *Finding Extreme Values (TI-89 Titanium) — 3244*
- *Newton's Method (TI-89 Titanium) — 3221*
- *Functions and Their Extrema (TI-89 Titanium) — 6436*

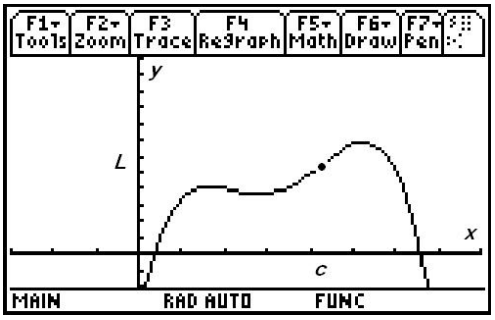
Part 1 – Introduction & Limits

Students will read the information given on their worksheet to become introduced to the major concepts of calculus. This information will then be used to answer questions on the student worksheet. The activity begins with an overview and then transitions to limits.

Student Solutions

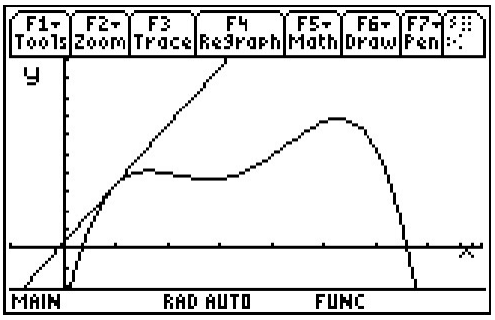
1. Students may have heard a variety of things about calculus, some true and others not so much. This question can be helpful to identify and correct misconceptions.

2. The value of $f(x)$ appears to be getting close to the value marked L. L is the limit of $f(x)$ as x approaches c.



Part 2 – Derivatives & Optimization

Part 2 transitions to the concept of the derivative. Important calculus terminology is used, including extrema, maxima, minima, neighborhood, and local max and min. Students can use the animation of a 4th degree polynomial to answer questions involving extrema, slope, and local maximum and minimum points.



After viewing each graph using the program *whatcalc*, students do not need to exit the program. There are no calculations that students need to do outside of the program, so they can just select the next menu item when they are ready for that portion of the activity. After students are finished with each graph, they should press ENTER to return to the menu. If students do select **5:Quit** from the menu, they will need to start the program again from the Home screen.

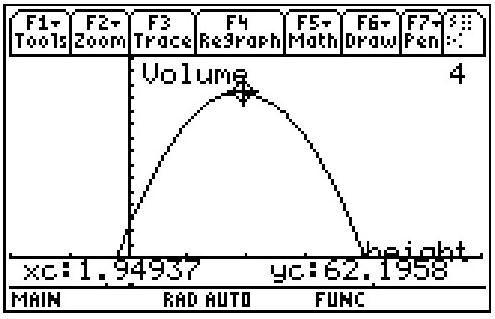
Student Solutions

3. This 4th degree polynomial has 3 extrema.

4. The slope of the tangent at a max or min is zero.

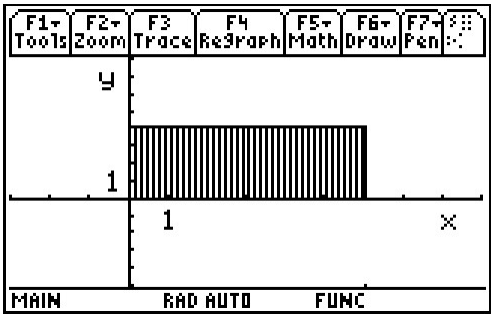
5. **a.** The approximate maximum volume is 62.22 in^3 when the height h is 1.9 in.

b. With calculus, the exact maximum can be found by finding the derivative and setting it equal to zero.



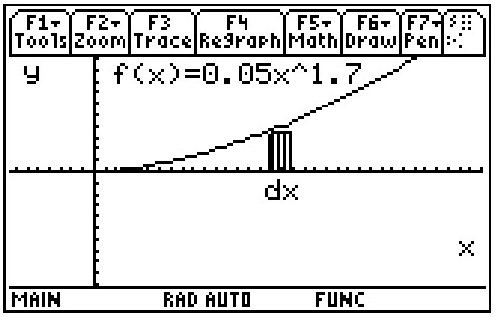
Part 3 – Integrals & History

Finally the area under the curve is introduced and applications to the Fundamental Theorem of Calculus are discussed.



Student Solution

6. The rectangle has an area of 24.



Student Solutions

7. The volume is found by rotating the function about $y = 0$, or the x-axis.

8. Newton and Leibniz independently co-discovered calculus.

9. Sample answer: Limit is what the function is close to when the x-value gets close to c. The derivative is the slope of the tangent and has to do with rate of change. The integral is the sum of infinitesimals and is related to the area of under the curve.