CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S1211

Project Title
Trapezoidal or Midpoint

Abstract

Objectives/Goals
The purpose of the experiment was to find out if the trapezoidal approximation or the midpoint approximation gives a more accurate result for the area under the curve. I hypothesized that the trapezoidal method will give a better approximation of the area under any curve.

Methods/Materials
1.Take the functions: y=0.5(x-2) 2 =1 intervals [0,4], y=2x-1 interval [0,4], y= cos x interval [0 p/2], y= e (x-2) interval [0,4], y= -3x+2 interval [0,4], y= sin x interval [0, p], y= -0.5 (x-3) 2 +3 interval [0,6], y= -e (3-x) interval [0,6].
2.Find the actual area under the curve using integration.
3. Divided the curve into 2, 4, 8, 12, 16, 18, 22, 24 subdivisions.
4. Using the trapezoidal method, find the approximate area under the curve using these subdivisions.
5. Using the midpoint method, find the approximate area under the curve using the same subdivisions.
6. Recorded the results and compared them to the actual area under the curve.

Materials:
·TI-83 Plus Graphing Calculator
·TI-83 Plus Computer Link and Program
·TI-83 Plus Trapezoidal and Midpoint Programs (on calculator)
·Graph Paper
·Ruler
·Pencil
·Computer

Results
After examining the data, I found that my hypothesis was incorrect. In the case of linear functions, such as y= -3x+2 and y= 2x-1 in the interval of [0,4], the area were always exact regardless of the number of intervals or the method we used. In the case of exponential functions such as y= e (x-2) in the interval [0,4] and y= -e (3-x) interval [0,6] the midpoint method gave a better approximation of the area under the curve. In the case of Trigonometric functions such as, y= cos x in the interval [0,p/2] and y= sin x, interval [0,p], the midpoint method gave a better approximation for the area under the curve. In the case of parabola such as y= -0.5(x-3) 2 +3, intervals [0,6] and y= 0.5 (x-2) 2+1, interval [0,4] again the midpoint method gave the better approximation to the area under the curve. In almost all the cases we found that,

Summary Statement
To find if the Trapezoidal or the midpoint method will give you a better approximation or area under any curve.

Help Received
Mother helped use TI calculator; mother and father helped with the board