TI Lab 1: Useful Stuff

In this lab, you will: evaluate functions from the home screen;
enter lists from the home screen;
change the graphing style;
display a graph and its table side-by-side;
set up the table using values you determine.

1. Enter `Y1=X^3-4X` and graph this on the standard "10 by 10" window. To find the value of y when $x = 1$, you can do one of three things:

- From the `CALC` menu, choose `value`, press `1`, then press `ENTER`;
- Press `TRACE`, press `1`, then press `ENTER`;
- Go back to the home screen, and enter `Y1(1)`.

(To type `Y1` on the home screen, you must choose this from the Variable menu: press `VARS`, go to the `Y-VARS` menu, choose `1:Function...` and `Y1` is the first option. Notice all other `Y` variables are listed there.)

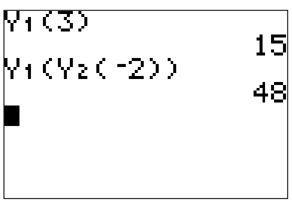
a) Using the home screen entry method, find `Y1(3)`.

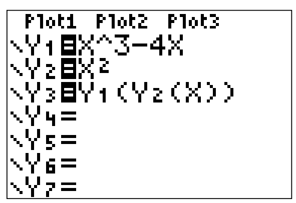
This method has its advantages. Enter `Y2=X^2`. Now you can evaluate the composition of two (or more!) functions.

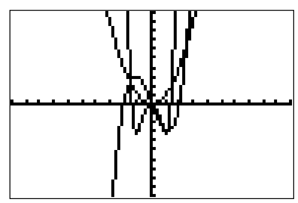
b) Evaluate `Y1(Y2(-2))` and `Y2(Y1(-2))`.

You can also graph the compostition of functions.

c) Enter `Y3=Y1(Y2(X))` and graph it, along with `Y1` and `Y2`.

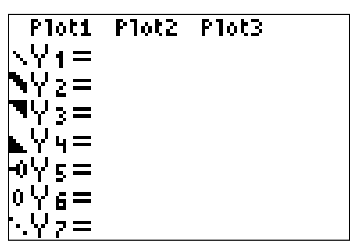






2. All three functions from Problem 1 part (c) are hard to make out when they are graphed on the same screen. Luckily, your calculator allows varying graph styles so you can determine which curve is which. They are

Normal style
Bold style
Shade above the graph
Shade below the graph
Trace and leave a trail
Trace but don't leave a trail
Dotted

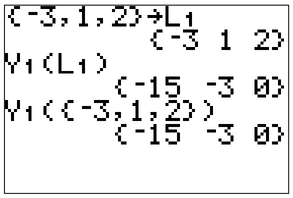


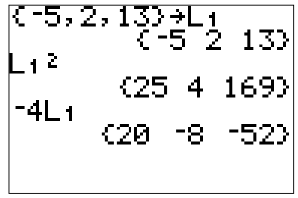
To change from one style to the other, position the cursor over the current style and press enter repeatedly until the style you want appears.

Using the functions from Problem 1 part (c), change `Y2` to dot style and `Y3` to bold style. Graph them again.

3. Like evaluating functions, lists do not have to be entered through the `STAT EDIT` menu—they can be entered from the home screen. To enter the numbers -3, 1, and 2 into a list, store it as List 1 by typing `{-3,1,2}`→`L1`. The → symbol (which means "store into") is made by pressing the `STO` key. An advantage of this is that functions can be evaluated using lists. To evaluate `Y1` at three points $x = -3$, $x = 1$, and $x = 2$, simply enter the x-values in `L1` and then enter `Y1(L1)`. You may also enter the list directly, without storing it by typing `Y1({-3,1,2})`.

You may also perform normal arithmetic operations on lists. Evaluate the function in `Y3` at the points -2, 0, 3, and 5 using a list.

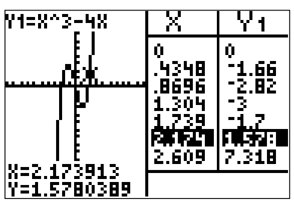


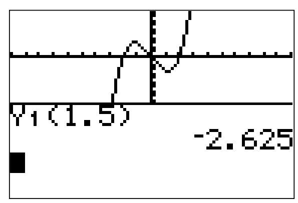


4. Clear `Y2` and `Y3`. Sometimes it is convenient to view both a graph and its table. To view both `Y1` and its table, press the `MODE` button and move to the last row. There are three options: `Full`, `Horiz`, `G-T`. (`Full` should already be highlighted.) Move the cursor to `G-T` and press `ENTER` to highlight it. Then press `GRAPH`. You should see the screen split vertically, with the graph on the left and the table on the right.

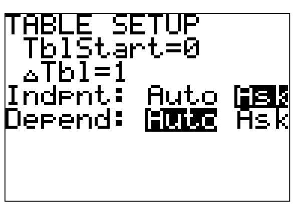
Pressing `TRACE` matches the table with the values from the graph. Like any other graph or table, you may change the window, set up the table, or zoom just as before.

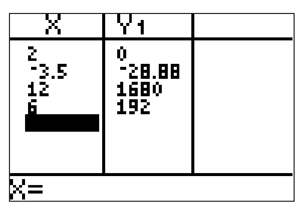
To view the graph and still perform operations on the home screen, change the mode to `Horiz`. Then the screen is split horizontally, with the graph on the top and the home screen on the bottom.



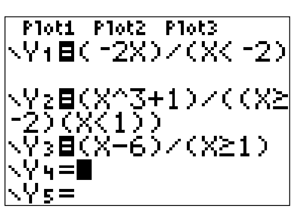


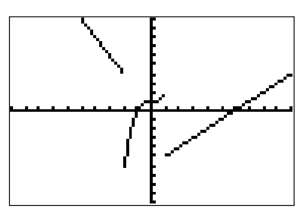
5. Finally, if you want specific values in your table, you may enter them manually, and the table will show only those values! This is done by selecting `Ask` on the `Indpnt` line in the `TBLSET` menu. Once `Ask` is selected, pressing `TABLE` allows you to enter whatever x-values you want to fill your table.





6. To graph a piecewise function like $f(x) = \begin{cases} -2x & x < -2 \\ x^3+1 & -2 \le x < 1 \\ x-6 & x \ge 1 \end{cases}$, you must enter the each piece divided by each condition on a separate line. The greater and less than symbols are located in the `TEST` menu (`2nd MATH`). The figures below show the function and its graph.





TI Lab 2: Derivatives

IN THIS LAB, YOU WILL:
- CALCULATE THE DERIVATIVE OF A FUNCTION AT A POINT FROM THE HOME SCREEN;
- CALCULATE THE DERIVATIVE OF A FUNCTION AT A POINT FROM THE GRAPH;
- GRAPH THE DERIVATIVE OF A FUNCTION;
- GRAPH TANGENT LINES; AND
- USE A PROGRAM TO FIND THE DERIVATIVE OF A FUNCTION DEFINED BY A TABLE OF VALUES.

1. The TI-83 calculates an approximation to the derivative of a function $f(x)$ around the point $x = a$ like this:

$$f(x) \approx \frac{1}{2}\left[\frac{f(a+h) - f(a)}{h} + \frac{f(a) - f(a-h)}{h}\right].$$

This is basically the definition of the derivative, calculated from both left and right sides of a, and then the average is taken. The command for the derivative is `nDeriv` and is under the `MATH` menu as choice 8. The format is `nDeriv(`*function, variable, point, h*`)`. The calculator automatically uses the value $h = 0.001$, but you can specify another value (the smaller the value, the more accurate the answer and the longer it takes to calculate).

a) Evaluate the derivative of $f(x) = x^3 - 4x$ at the point $x = 4$ by entering `nDeriv(X^3-4X,X,4)`.

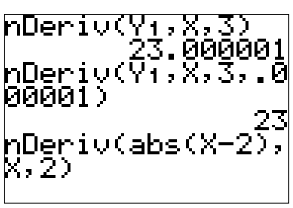
WARNING: `nDeriv` will not give good results of you mistakenly attempt to evaluate the derivative of a function where the derivative is not defined! For instance, $f(x) = |x - 2|$ is not differentiable at $x = 2$, and so the derivative there is undefined.

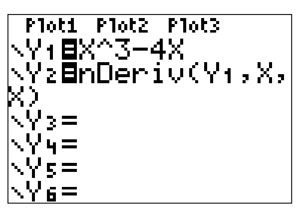
b) Enter `nDeriv(abs(X-2),X,2)`. What did you get?

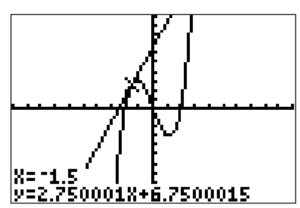
2. You can use nDeriv to graph the derivative of a function without finding the expression for the derivative.

a) Enter `X^3-4X` into `Y1`. Enter `Y2=nDeriv(Y1,X,X)`. Then choose `ZStandard`. Obviously the derivative of `Y1` is $3x^2 - 4$. Enter this on `Y3` and compare with `Y2` using the table. How accurate is the derivative approximation?

b) Clear `Y3`. Enter `Y1=sin(X)`, and change the graph style to bold on `Y2`. Make sure the mode is radians and then select `ZTrig`. What function does the derivative resemble?







3. The TI-83 can also graph the tangent line to a function at a point. That function is in the `DRAW` menu (`2nd PRGM`).

Clear `Y2`. Enter `Y1=X^3-4X` and choose `ZStandard`. With the graph on screen, choose tangent from the `DRAW` menu. Move the cursor to a point at which you want the tangent (or enter the x-value) and press enter. Notice that the equation of the tangent is at the bottom of the screen. What is the approximation to the tangent line? (When you are finished, you must choose `ClrDraw` from the `DRAW` menu to remove the tangent line, or clear the `Y=` screen.)

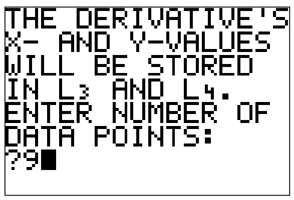
4. There is also a way to calculate the derivative directly on the graph by using the `dy/dx` function on the `CALC` menu (it is choice 6). Move the cursor to the point at which you want to calculate the derivative (or enter the value) and press `ENTER`. Remember that this is only an approximation.

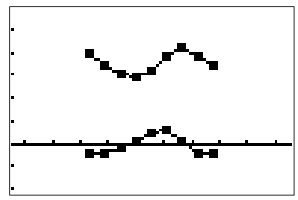
Graph $y = x^3 + x^2 + e^{-x/2}$ on the standard window and find the derivative at the points $x = 1$, $x = 2$, and $x = -0.95$. What conclusion can you draw from the value of the derivative at $x = -0.95$?

5. Finally, the program `DERDATA` calculates the approximate derivative from a function defined by a table of values. The x-values must be entered in `L1` and the y-values go in `L2`.

a) The following table gives the unemployment rate (as a percentage) in the U.S. for the years listed. Estimate the rate of change (the derivative) in the unemployment rate for the years 1987 and 1992.

year (x)	1986	1987	1988	1989	1990	1991	1992	1993	1994
% (y)	7.0	6.2	5.5	5.3	5.6	6.8	7.5	6.9	6.1





b) Estimate the derivative at $x = -1$ and at $x = 2$ for the function defined by the following table.

x	-6	-5	-2	-1	0	2	3	7
y	-3.8	-2.85	-1.66	-1.5	-1	0.08	0.83	5.83

TI Lab 3: Maxima, Minima, Inflections

In this lab, you will: find better approximations for the maximum and minimum of a function; and use a program to determine points of inflection.

1. As you know, the maximum and minimum values of a function can be found by using `max` or `min` from the `CALC` menu. These values, though easy to find, aren't as exact as they could be. The first derivative test gives us another way to calculate extreme values: we graph the derivative and determine its zeros.

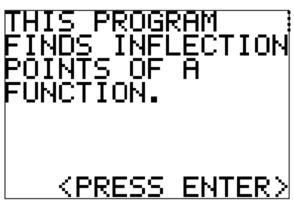
Graph $y = \dfrac{\sqrt{4+x^2}}{3} + \dfrac{10-x}{4}$ and its derivative (remember, you do not have to find the derivative in order to graph it). Use the `min` function to find the minimum of y, then use the `zero` function to find the zero of the derivative. Which is more exact? Use your table on `Indpnt:Ask` to find out.

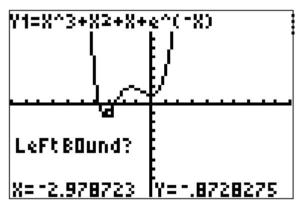
2. The program `INFLECPT` will locate inflection points on a graph. The program uses `nDeriv` twice—it simply looks for zeros of the second derivative. This program needs you to tell it where to start looking for the inflection point. So it asks for left and right bounds, just like `max`, `min`, or `zero` functions.

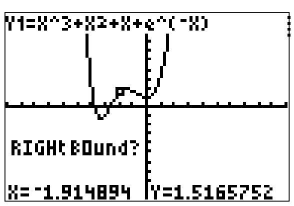
a) Use `INFLECPT` to find the inflection point of $y = x^3 - 2x^2 - 4x + 3$.

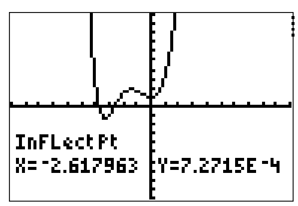
b) Find the inflection points of $y = x^3 + x^2 + x + e^{-x}$.

c) Determine the intervals where $y = e^{x/2} - \ln(x^3+1)$, for $x > -1$, is increasing, decreasing, concave up, and concave down. Use the window $-1 \le x \le 4$ and $-2 \le y \le 3$.









TI Lab 4: Integrals

In this lab, you will: calculate definite integrals from the home screen;
calculate definite integrals from a graph;
calculate definite integrals of piecewise functions;
graph the integral of a function;
discover a function that is defined by an integral; and
use a program to find the average value of a function.

1. Just as you calculate derivatives at a point, you can compute definite integrals on your calculator. The command `fnInt` approximates a definite integral. The format is `fnInt(`*function, variable, lower, upper, tolerance*`)`, where tolerance is the degree of accuracy with which you wish to compute the integral. If you do not specify a value, the calculator assumes that the tolerance is 0.0001.

a) Evaluate $\displaystyle\int_0^1 \frac{4dx}{1+x^2}$.

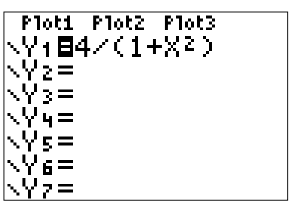
b) Evaluate $\displaystyle\int_{-1}^3 \frac{\sin x}{x}\,dx$. Make sure you are using radians!

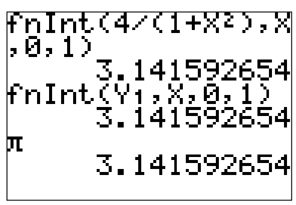
(Notice that the calculator evaluates the integral in part (b) even though the integrand is not defined at $x = 0$!)

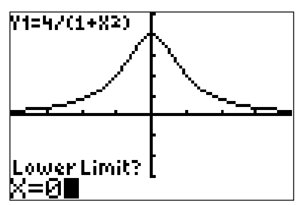
2. Like `nDeriv`, you can store the function you wish to integrate as `Y1` and enter `fnInt(Y1,X,`*lower, upper*`)`. The advantage to entering the function in `Y1` is that there is also an integral function located under the `CALC` menu—`7:∫ f(x)dx`. Not only will the `∫ f(x)dx` command evaluate the definite integral, it will shade the area the integral represents!

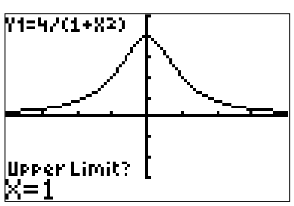
a) Enter `Y1=sin(X)/X` and graph it using `ZTrig`. Use `∫ f(x)dx` to evaluate $\displaystyle\int_{-1}^1 \frac{\sin x}{x}\,dx$. Enter the lower or upper limits (or `TRACE` them) and press `ENTER`.

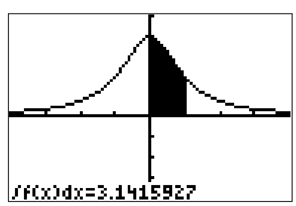
b) Graph the function $f(x) = \begin{cases} x+3 & x \le 3 \\ -(x-5)^2 & x > 3. \end{cases}$ Then evaluate $\displaystyle\int_{-5}^7 f(x)\,dx$ and $\displaystyle\int_{2.5}^{3.5} f(x)\,dx$.







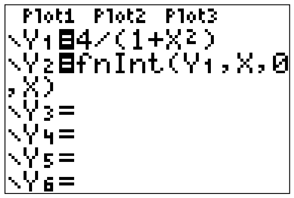


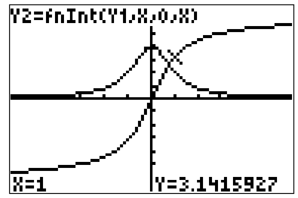


3. You may also graph the integral of a function.

a) Enter `Y1=3X^2-4` and enter `Y2=fnInt(Y1,X,0,X)`. This graphs the integral of `Y1`. Clearly, the integral is equal to $x^3 - 4x$. Enter this expression on `Y3` and compare the accuracy of `Y2` using your table.

You probably noticed that the graph of `Y2` goes very slow. This is because the calculator is evaluating the integral at every pixel. Adjusting `Xres` in the `WINDOW` menu to a higher value (say 2 or 3) will reduce graphing time, but will also reduce accuracy.





b) Find the position of a particle at $x = -\frac{1}{2}$ and $x = 1$ if the particle's velocity is $\dfrac{1}{\sqrt{4-x^2}}$, for $-2 < x < 2$.

c) Clear your `Y=` screen. Enter and graph `nDeriv(fnInt(X^3-4X,X,0,X),X,X)`. Change `Xres` to 2 and use `ZStandard`. (This will take up to 40 seconds to graph.) Does the graph look familiar? Which function is it?

4. Many important functions are defined as integrals. Consider the function

$$L(x) = \int_1^x \frac{1}{t}\,dt,$$

for $x > 0$. The function L is undefined for $x > 0$ since $f(t) = 1/t$ is not continuous at $t = 0$.

a) Graph `Y1=fnInt(1/T,T,1,X)` in the window $0.01 \le x \le 10$ and $-1.5 \le y \le 2.5$.

b) For what values of x is $L(x) = 0$?

c) Use the table to make a list of approximate values for $L(x)$ using 8 equally spaced values starting with $x = 1$.

d) Verify from the table created in part (c) that:

$$L(6) = L(2) + L(3), \qquad L(4) = 2L(2), \qquad L(8) = 3L(2)$$

e) From the home screen, enter {`1,2,3,4,5,6,7,8`}→`L1` then enter `Y1(Ans)`→`L2`. This puts the x-values and y-values from the table in part (c) into lists. Now, from the `STAT CALC` menu, choose `LnReg` to fit a logarithmic regression curve to the data. What is the equation of the curve that best fits the data?

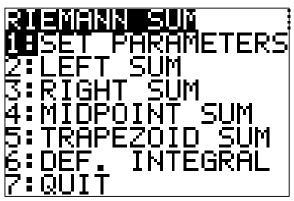
f) What is the derivative of $L(x)$?

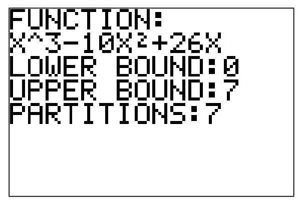
TI Lab 5: Approximating Integrals with Sums

In this lab, you will: approximate a definite integral using a Riemann sum program.

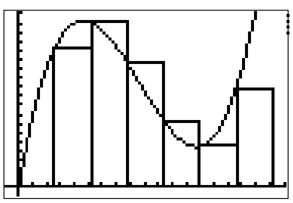
1. Now that you have learned how to approximate a definite integral using a Riemann Sum, it's time you learned how to do this on your calculator by using the program `RIEMANN`. The first screen you see upon running the program is the one below on the left. Not only can you calculate left- and right-hand sums, you can also calculate midpoint sums and sums of trapezoids that approximate the area. To use this program, you **must always** choose option `1:SET PARAMETERS`. This is where you enter the function and set upper and lower bounds.

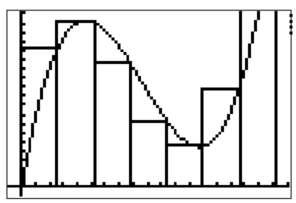
a) Run the program. Enter $x^3 - 10x^2 + 26x$, lower bound 0, upper bound 7, and 7 partitions.

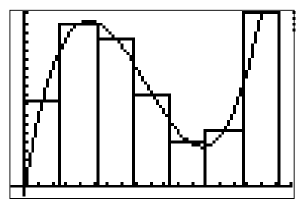




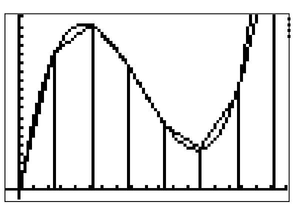
b) When you select one of the sums, the program graphs the function over the interval [*lower, upper*] and draws the appropriate rectangles. Find the left-hand sum, right-hand sum, and midpoint approximations for the function in part (a).

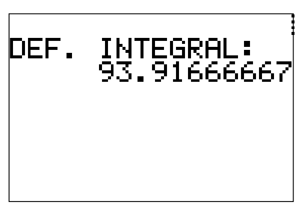






c) Next, select the trapezoid approximation. You will learn more about approximating a definite integral with trapezoids in the next Calculus Lab. Finally, select the definite integral. This option is here so you can immediately compare the more exact value with the various approximations.





2. Find the left-hand, right-hand, midpoint, and trapezoid sum approximations for the function

$$e^{-x}\ln(x+2) - x + x^2 - \frac{1}{5}x^3$$

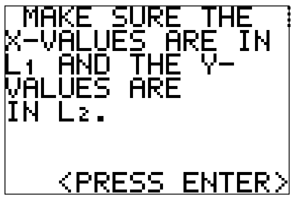
over the interval $[0, 6]$. Use 6 partitions.

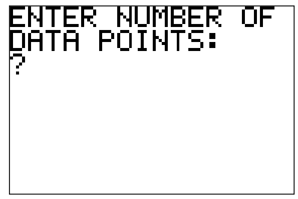
3. Repeat problem 2 with 12 partitions.

TI Lab 6: Approximating Integrals with Sums II

In this lab, you will: use programs to approximate a definite integral in various ways

1. The program `RIEMANN` allows us to estimate various rectangular approximations and a trapezoid approximation to a definite integral, if we know what the function is. Often, we are simply given a table of data and asked to estimate the value of the definite integral of the function represented by the table. The `RIEMANN` program does not allow the function to be defined by a table. Luckily, you have another program that does just that, using trapezoids: `TRAPDATA`.





To use `TRAPDATA`, you must first enter the x- and y-values in `L1` and `L2`, respectively. Then the program prompts you for the number of data points and returns the trapezoid rule approximation.

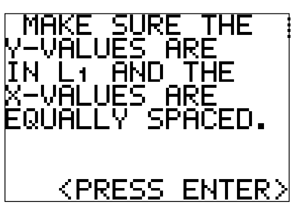
a) In an experiment, oxygen was produced at a continuous rate. The rate of oxygen produced was measured each minute and the results are given in the table below. Use `TRAPDATA` to estimate the total amount of oxygen produced in 6 minutes.

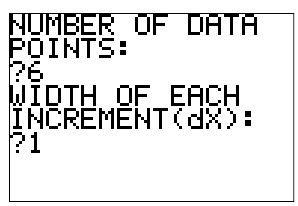
minutes	0	1	2	3	4	5	6
oxygen (ft^3/min)	0	1.4	1.8	2.2	3.0	4.2	3.6

b) All the information given about the continuous function f is found in the table below. Estimate the area of the region below the graph of f and above the x-axis over the interval $[1, 2]$.

x	1	1.2	1.4	1.6	1.8	2
$f(x)$	7.3	6.8	4.9	5.4	6.0	5.8

2. The program `SIMPDAT` also approximates the value of a definite integral of a function defined by a table. This program, however, uses Simpson's Rule.





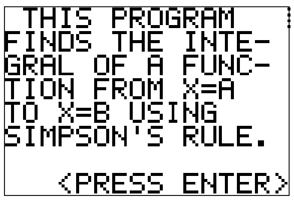
`SIMPDAT` is not as user friendly as `TRAPDAT`. You can only use this program if the x-values are equally spaced (in other words, if the change in each x-value is the same) and there are an even number of sub-intervals. Since the x-values are equally spaced, there is no need to enter the x-values—you are prompted for the number of data points and the width of each subinterval (how far apart the x-values are spaced). Note that the y-values go in `L1`.

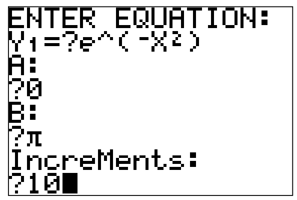
a) Repeat problem 1 part (a) using `SIMPDAT`.

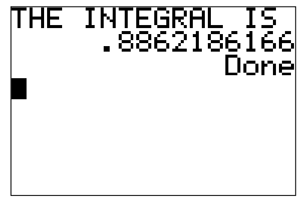
b) Compare your answers. Which is more accurate: the answer given by the trapezoid rule or by Simpson's Rule?

c) Repeat problem 1 part (b) using `SIMPDAT`. Why is the answer such an underestimate compared to using the trapezoid rule?

3. Finally, the program `SIMPEQ` approximates a definite integral of a function if the equation is known! The only qualification is that there must be an even number of subintervals.







a) Run `SIMPEQ` and enter the function $x^3 - 10x^2 + 26x$. Estimate the definite integral over $[0, 7]$ using 6 increments.

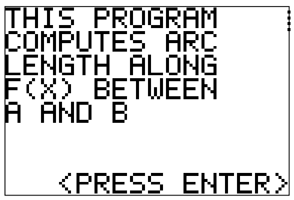
b) Repeat part (a) with 12 increments.

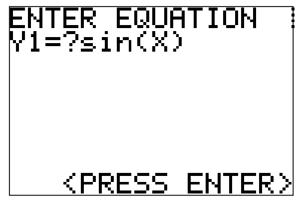
c) Using Simpson's Rule, estimate the value of $\displaystyle\int_{0.32}^{\pi} \sin(1/x)\, dx$ to three decimal places.

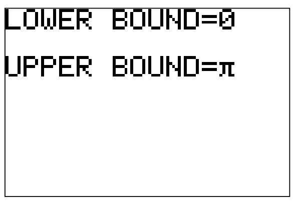
TI Lab 7: Applications of Integrals

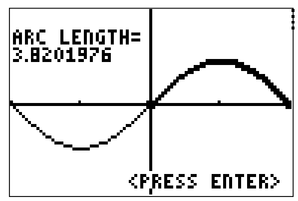
In this lab, you will: use a program to approximate the arc length of a curve; and
use a program to approximate the volume of a solid of revolution.

1. The program `ARC` uses the the calculator's definite integral function to determine the arc length of a function. In the figures below, the arc length of $\sin x$ from 0 to π is calculated. Notice that the program shaded the part of the curve whose length you found.









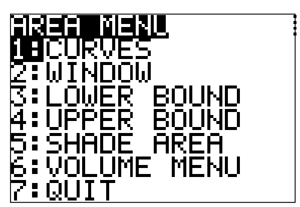
a) Set up the integral that represents the length of the curve $\arctan x$ from 0 to π, then use the program to find the length.

b) Set up the integral that represents the length of the curve $e^x + e^{-x}$ from -1 to 1, then use the program to find the length.

2. The prorgam `VOLUME` determines the volume of a solid of revolution. This program does a lot to accurately compute the volume and draw the solid—therefore, it is quite invovled!

a) In this example, we compute the volume of the solid formed by revolving the region between x^2 and the x-axis from 1 to 3 around the line $y = -1$.

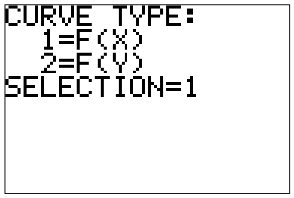
We begin with the Area Menu. This is the first screen you see upon running the program. You must choose options 1 through 4 (in that order) before you choose option 6 to compute volume!

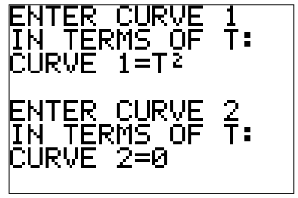


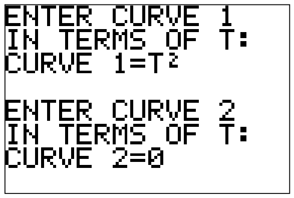
After selecting option 1, you are asked to choose which type of curve you have. If the solid you wish to form is revolved around a horizontal axis, choose `F(X)`; if it is revolved around a vertical axis, choose `F(Y)`. In this case, we have a horizontal axis of rotation.

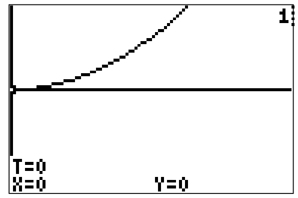
Then you are asked to enter the curves. (Notice that it says "in terms of t." This is becuase the calculator will graph the curve parametrically in order to then graph the solid formed.) Here, we enter t^2 as the first curve and 0 as the second, since the second curve is the x-axis.

The next screen asks you to set the graph window, then the graph is shown. Notice that you want to set the window appropriately so that you will be able to see the entire region once it is rotated.

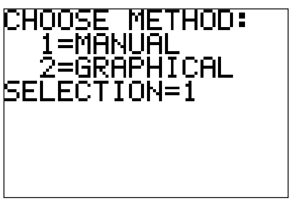


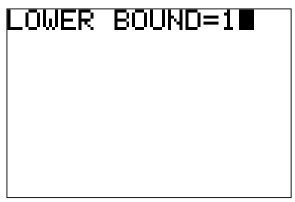


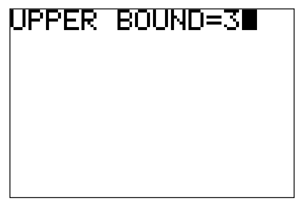


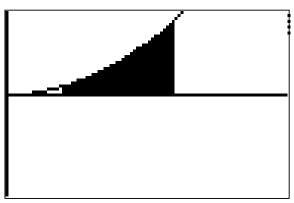


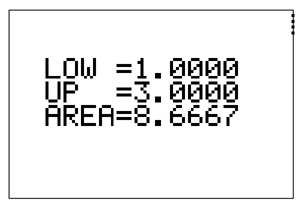
Next, you must set the upper and lower bounds for the region. For both bounds, you are given the option of entering the bound (manual) or tracing the graph to select the bound. Since we know exactly what are bounds are, we choose Manual for both. Finally, you may choose option 5 to shade the region you will be rotating. After the shading is complete, pressing `ENTER` gives you the area of the region.



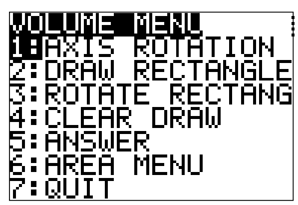




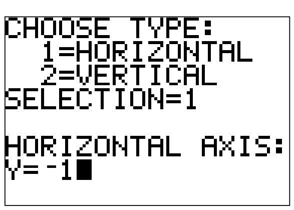


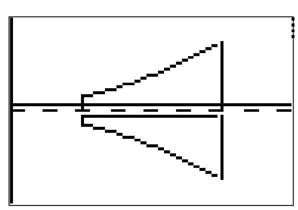


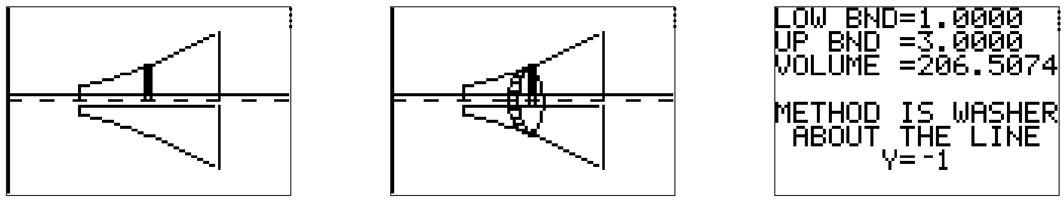
Finally, we are ready for the Volume Menu. This is where you choose the rotation axis. You may also choose tohave the calculator graph a representative rectangular region in the solid to revolve, although this is not necessary.



In our example, we want to revolve the region around $y = -1$. We choose option 1 and we are asked to choose whether the line is horizontal or vertical and then enter the line. Then the calculator graphs an "outline" of the solid with the axis of rotation as a dotted line. To draw a representative rectangular region, we choose option 2, and we are shown the graph of the region. Move the cursor up to any location on the graph of the function and press `ENTER`. Then a shaded rectangle is drawn. Next, choose 3 to rotate the rectangle. Finally, choose 5 for the answer to the volume question.



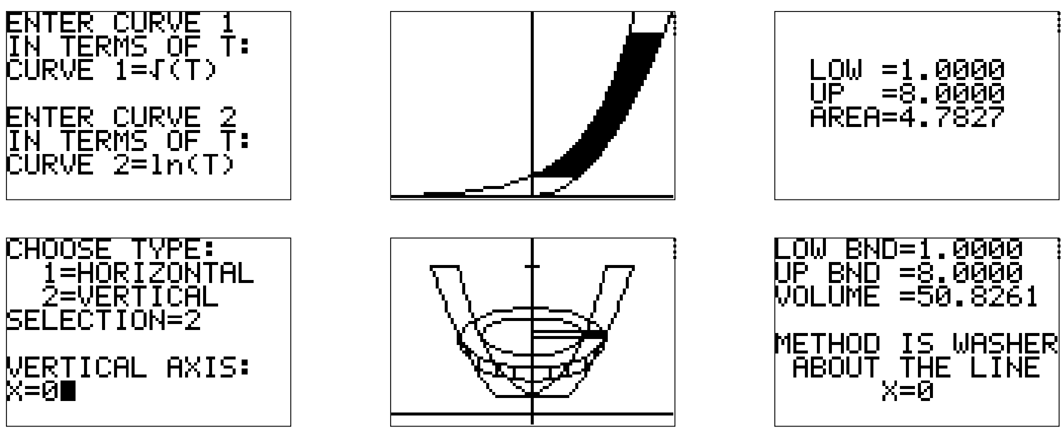




Drawing the figure is not necessary to compute the answer. Once the axis of rotation is selected, you can go immediately to the answer. Also notice that if you mess up, you have the option of going back to the Area Menu and re-entering your functions and bounds.

b) Find the volume of the solid formed by revolving the region between $y = x^2$ and $y = e^x$ about the y-axis from $y = 1$ to $y = 8$.

Since the rotation axis is vertical, we must select curve type `F(Y)`. This requires that both funtions and both limits must be entered in terms of y. The limits are already given in terms of y; simply solve both functions for y to get $x = \sqrt{y}$ and $x = \ln y$ and you are ready to find the volume.



c) The region R is bounded by the curves $y = \dfrac{-5(x+2)}{x} + 10$ and $y = \ln x$ from $x = 3$ to $x = 7$. Set up an integral that represents the volume of the solid generated by revolving the region around the line $y = 6$, then find the volume.

d) The region R is bounded by the curves $y = x^3$ and $y = e^{x/2}$ from $y = 3$ to $y = 7$. Set up an integral that represents the volume of the solid generated by revolving the region around the line $x = 1$, then find the volume.

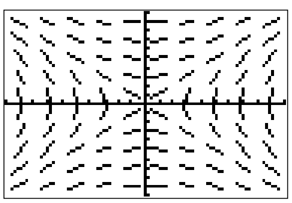
TI Lab 8: Differential Equations

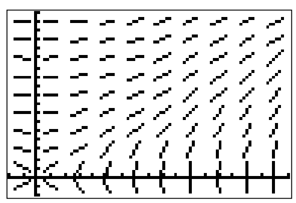
In this lab, you will: use a program to approximate a numerical solution to a differential equation using Euler's Method; and use a program to generate a slope field.

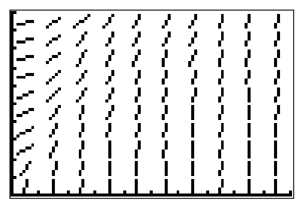
1. The program `SLOPEFLD` draws a slope field for a differential equation. To use this program, the differential equation must be solved for y'. Enter the resulting equation in `Y1` in terms of `X` and `Y` (`Y` is found by pressing `ALPHA` and `1`), then adjust your window to the appropriate size. Then run the program.

The only limitation to this program is that the program always draws 100 slope segments in a 10 by 10 array. Thus, if you want slopes at integer points, you will need a window of $-0.5 < x < 9.5$ and $-0.5 < y < 9.5$. This will create slope segments at integer values along each axis (up to 9) and throughout the first quadrant (up to the point $(9, 9)$). Any multiple of this window will create slope segments at integer points as well: for instance, multiplying by 2 results in a window of $-1 < x < 19$ and $-1 < y < 19$ and creates slopes at even integer points. If you want other quadrants as well, simply shift the window: subtracting 9 from both x and y results in a window of $-10 < x < 10$ and $-10 < y < 10$ and creates slopes at odd integer points.

Plot a slope field for the differential equation $y' = x/y$. The graphs below show you the difference a window makes.


$-10 < x < 10,\ -10 < y < 10$

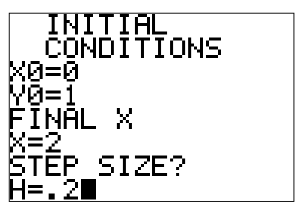

$-2 < x < 18,\ -2 < y < 18$


$0 < x < 50,\ 0 < y < 20$

Try using the -0.5 by 9.5 window. What happened? Why?

2. The program `EULER` approximates the value of a differential equation and is self-explanatory. The differential equation must be solved for y'. Enter the resulting equation in `Y1` in terms of `X` and `Y`, and run the program. "`FINAL X`" is the point at which you want the approximation. Press enter repeatedly to get the successive approximations.

Plot a slope field for the differential equation $x + y' = xy$. Use an appropriate window to get a good idea of what happens around the origin. Then use Euler's method to approximate y at $x = 2$ with an initial value $y(0) = 1$ and step size 0.2.

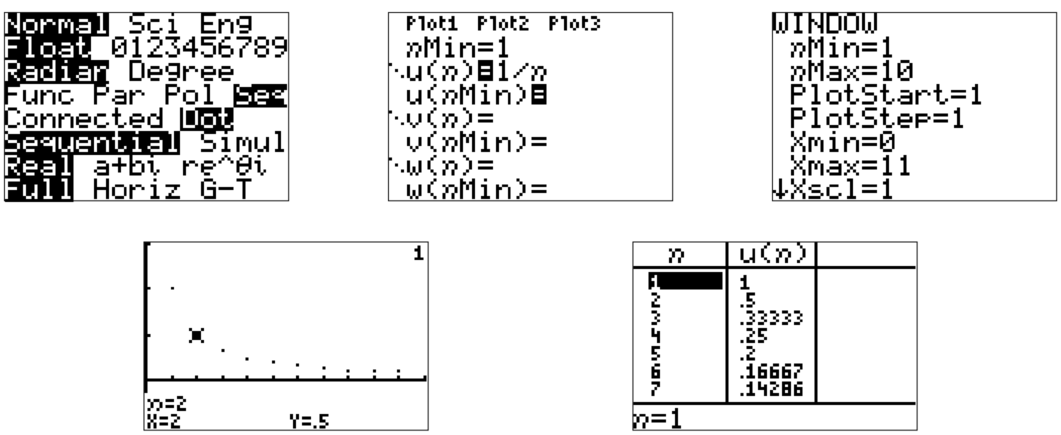


TI Lab 9: Sequences and Series

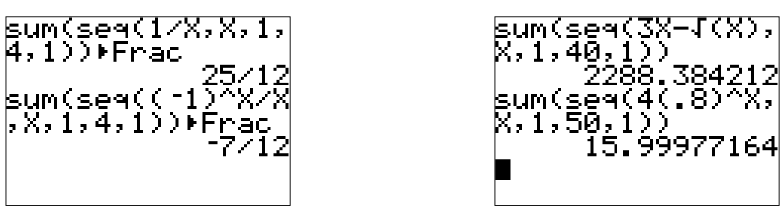
In this lab, you will: generate a list of terms in a sequence;
find the sum of a finite number of terms in a sequence;
graph a sequence; and
use a program that finds the sum of finite terms
of a geometric series.

1. Your calculator can generate terms of a sequence easily and quickly. Go to the `LIST` menu (`2nd STAT`) and over to `OPS`. Choice 5 is the sequence command. The format for the sequence command is `seq(`*sequence, variable, start, end, increment*`)`, where *start* and *end* refer to the term numbers and *increment* tells the calculator how to count from start number to end number. For instance, the first 4 terms of the sequence $1/n$ are given in the figure below. Note that you can change the sequence to fractions and store the sequence as a list.

2. Your calculator can also graph terms in a sequence. To do this, your calculator's `MODE` must be `Seq` and `Dot`. When you press the `Y=` button, you get the screen shown below. `nMin` is the starting value of `n` and `u(n)` is the sequence. The window screen is different as well. In addition to the x and y scales, you have `nMin`, `nMin`, `PlotStart` and `PlotStep`. Clearly, the range of `n` values you wish to graph is `nMin` and `nMax`. `PlotStart` is the `n` value you wish to begin graphing and `PlotStep` is the increment. Finally, pressing the graph button produces a graph over which you may trace values. The table is also available in `Seq` mode as well.



3. To find the sum of some finite amount of terms, go to the `LIST` menu and over to `MATH`. Choice 5 is sum. The figure below shows the format to obtain the sum of terms in a sequence.



4. The program SERIES combines the summing and graphing features in one program—however, it is only good for geometric sequences. Here, we run the program on the geometric sequence $\{4(0.8)^n\}$. The advantage to using this program is that it will give you the value of the infinite sum (if the geometric series converges), and it graphs the partial sums so that you may observe the convergence or divergence of the series.