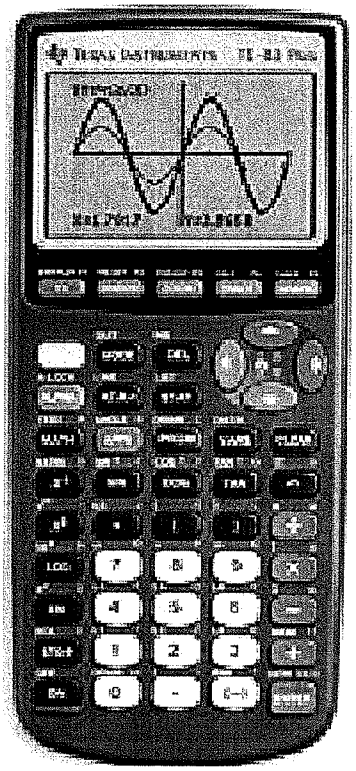
TI -82/83/84
Calculator Guide



Green River Community College
Mathematics Division

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BASIC OPERATIONS – TI 82/83/83Plus

Turning on your calculator: The [ON] button is located in the lower left hand corner of your calculator.

The different colors on your calculator: The [2nd] key may be used to retrieve the operations "above" the main keys of your calculator. These operations will be in blue for the TI-82 and yellow for the TI-83 or TI-83Plus.

Example: To **turn off** your calculator, press [2nd], [ON].

Clearing the screen: You may clear the screen at any time by pressing the [CLEAR] button.

Returning to the "Home" Screen: The "home" screen of your calculator is the screen where you perform all calculations (such as addition, etc.) You may return to the "home" screen at any time by pressing [2nd] [MODE] (QUIT).

Example: Press [Y=] to see a new screen. To return to the "home" screen, press [2nd] [MODE].

Parentheses: Your calculator recognizes basic order of operations (multiplication before addition, etc.). The parentheses keys [(] [)] may be used as grouping symbols to ensure that the operations inside the parentheses get done first.

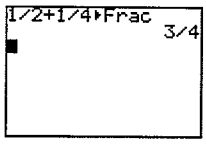
Example: To enter $\frac{20}{3+2}$, press [2] [0] [÷] [(] [3] [+] [2] [)] [ENTER] (Result = 4)

The Negative Key: The TI-82, 83, and 83Plus distinguish between subtraction [−] and the negative sign [(-)].

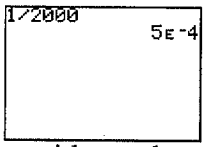
Example: $-4+6-2$ is entered [(-)] [4] [+] [6] [−] [2] [ENTER] (Result = 0)

Fractions: An answer is given as a fraction by using the MATH menu. After you enter your desired calculation, you must press the [MATH] button, followed by [1] (▸ Frac).

Example: To add ½ and ¼ , press [1] [÷] [2] [+] [1] [÷] [4], then [MATH] [1] [ENTER]



Scientific Notation: Many times your calculator will give you an answer in scientific notation. If you see 5 E −4 in your display window, this implies 5×10^{-4} or 0.0005.



You may also perform calculations with numbers in scientific notation using the "EE" command located "above" the [,] key.

Example: To find $(3.2\times10^{-8})\times(2.2\times10^{12})$, press [3] [.] [2] [2nd] [,] [(-)] [8] [×] [2] [.] [2] [2nd] [,] [1] [2] [ENTER] (Result = 70,400)

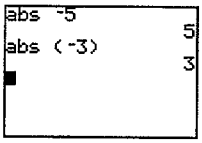
Absolute Value: The absolute value of a number ($|-3|$) can be calculated on your calculator using the command "abs".

- On the TI-82, "abs" is located in blue above the [x^{-1}] key.

  Example: To find $|-5|$, press [2nd] [x^{-1}] (abs) [(-)] [5] (Result = 5)

- On the TI-83 and 83Plus, "abs" is located under the [MATH] menu.

  Example: To find $|-5|$, press [MATH] and move over to NUM by pressing the right arrow key [▶]. Then, press [1] followed by [(-)] [5] [ENTER]. (Result = 5)



Exponents: The [^] key may be used to raise something to an exponent.

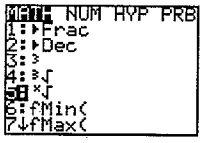
Example: 5^3 is entered [5] [^] [3] [ENTER] (Result = 125)

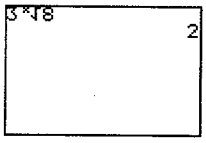
Square Root: The square root key is located "above" the [x^2] key.

Example: $\sqrt{25}$ is entered [2nd] [x^2] [2] [5] [ENTER] (Result = 5)

The nth Root: The nth root (or root higher than 2) of a number is taken by using the MATH menu. Under this menu, you will see $\sqrt[x]{\ }$.

Example: To calculate $\sqrt[3]{8}$, press [3], [MATH], the number corresponding to $\sqrt[x]{\ }$, then [8] [ENTER]

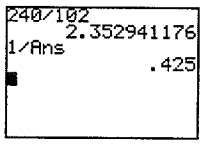




Alternate Method: $\sqrt[3]{8}$ is the same as $8^{1/3}$ which may be entered [8] [^] [(] [1] [÷] [3] [)] (Result = 2)

Retrieving Your Previous Answer: If you want to perform a new operation on your last answer, you may use the ANS option (located "behind" the [(-)] key).

Example: The latest answer on your viewing screen is 2.352941176 (240 ÷ 102) and you want to take 1 divided by this number. Press [1] [÷] [2nd] [(-)] [ENTER]



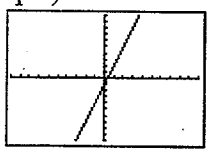
Retrieving and Editing Your Previous Entry: If you want to edit your previous entry, press [2nd] [ENTER] and use your arrow keys, the delete key ([DEL]), and the insert key ("above" [DEL]) to edit the numbers.

Example: You enter $36+2(4^2-1)$ getting a result of 66. However, you meant to square 5 instead of 4. Press [2nd] [ENTER], move your cursor by using your left arrow key ([◀]) and replace the 4 with a 5. (Result = 84)

GRAPHING – TI 82/83/83Plus

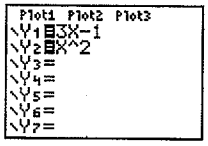
Basic Graphing: Graphing is controlled by the top row of keys, called the menu keys. (At any time in these graphing screens you wish to return to the main screen, hit [2nd] [MODE] (QUIT).) To enter the equation you wish to graph, hit the [Y=] key. Using the [X,T,Θ] key for the letter *x*, type in the expression after the Y_1=, and then hit [GRAPH].

Example: To graph y = 3x – 1, hit [Y=] [3] [X,T,Θ] [–] [1] [GRAPH]. You should get the following picture. (If you do not see this picture, try hitting the following keys: [ZOOM] [6] and see if that helps.)



Adding a Graph: To add another graph, go back to [Y=]. Use the down arrow key ([▼]) to scroll down to Y_2= . Type in the new expression. To see both graphs, you may then hit [GRAPH]. You may put in a total of 10 graphs.

Viewing Only One (or Some) of the Graphs: To turn one of the graphs off, go to the line you want to turn off and then use the left arrow key ([◄]) to highlight the equal sign. Hitting [ENTER] at that point acts like a toggle switch that either turns that particular graph on or off.



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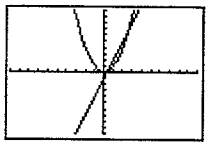

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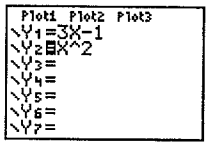

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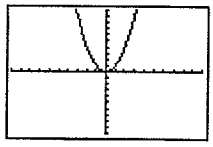
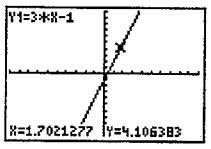
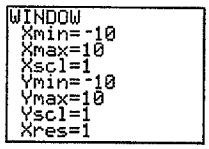


Tracing Along a Graph: If you have sketched a graph, you may use the [TRACE] key, along with the left and right arrow keys ([◄], [►]) to see the points on the graph. You must hit [TRACE] first or the arrow keys would just move on the screen but not along the graph. If you have more than one graph on the screen, the up and down arrows ([▲], [▼]) will move between the different graphs.

Example: If you start with the picture at the top of this page, [TRACE] [►] [►] [►] [►] [►] [►] [►] [►] [►] gives this picture

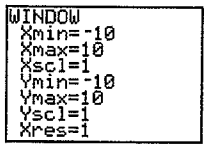


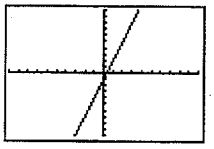
Viewing Window: The viewing window refers to the part of the Cartesian coordinate system that shows on the screen. If you hit [WINDOW] you should see the following screen. (If you do not see these values, hit [ZOOM] [6] [WINDOW] and you will.) Xmin is the smallest x-value and Xmax is the largest x value. Xscl refers to where the calculator puts the tick marks on the x-axis. Similarly for Ymin, etc.

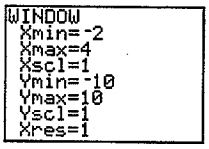


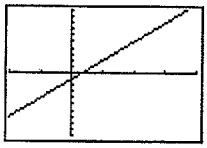
You may change any of the window values by using the up and down arrow keys to scroll down to the entry you want to change, and then just typing the new one. It is usually not necessary to change Xscl, Yscl, or Xres.

Example: Try changing the window with the following. Hit [GRAPH] just to look at what your graph looks like now. Then hit [WINDOW]. Change Xmin to –2 by hitting [(-)] [2] [ENTER]. Change Xmax to 4 by [4] [ENTER]. Hit [GRAPH] again and see the difference the window makes.

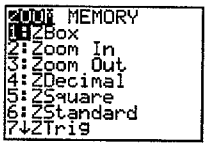


gives 



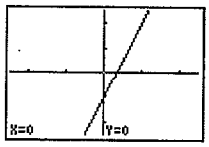
gives 

Zooming: Zooming includes many ways to change the viewing window quickly and efficiently. When you hit [ZOOM], you will see the following window. Some of these options are described below.



Zstandard: This goes back to the standard viewing window, -10 to 10 for x and –10 to 10 for y. **It is a good idea to do this at the beginning and end of any graphing session**. You should do it now. The graph of y = 3x -1 is shown on the standard window above Zooming.

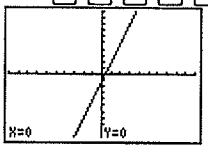
Zoom In: This zooms in to get a closer in picture of the graph. You can choose the center of the area in which you interested by using the arrow keys to move to where you want the center of the screen to be. The keystrokes are [ZOOM] [2], followed by the arrow keys if you want to change the center, then [ENTER]. The following is zoomed in without changing the center.

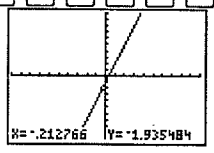


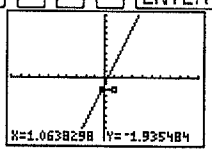
Zoom Out: This does the opposite of Zoom In. It is accessed with [ZOOM] [3] [ENTER].

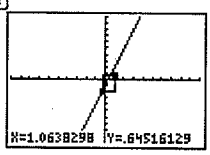
Zbox: This allows you to zoom in by creating a "box" around the part of the graph you want to see in your window.

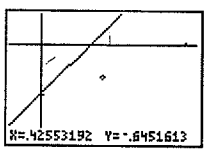
Example: The following keystrokes will cause the sequence of windows shown, if you have y = 3x – 1 entered. [ZOOM] [6] [ZOOM] [1] [◄] [▼] [▼] [▼] [▼] [▼] [▼] [▼] [ENTER] [►] [►] [►] [►] [►] [▲] [▲] [▲] [▲] [▲] [▲] [▲] [▲] [ENTER]











Zdecimal: This is a useful zoom if you are going to be tracing along the graph and would like your x-values to be "nice" decimal numbers. From the standard viewing window, Zdecimal will cause each horizontal pixel to be 0.1.

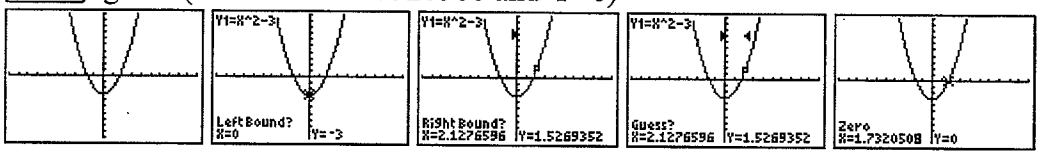
MAKING CALCULATIONS FROM A GRAPH – TI 82/83/83Plus

Calculating from the Graph: Typing [2nd] [TRACE] (CALC) accesses useful functionality, summarized below. **You must press [2nd] [TRACE] (CALC) each time you use these operations.**

value: Hitting this gives the graph with an X = ___. Put in any x-value, hit enter, and the y-value of the point on the graph will be calculated. If you have more then one graph showing, the up and down arrows will move between the different graphs. **Note: You will need to change your viewing window if the x-value you choose is outside your current window.**

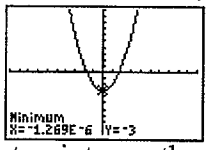
zero: This will calculate where a graph crosses the x-axis (meaning a y-value of zero). You must specify where to look by giving a left and right bound.

Example: Graph $y = x^2 - 3$ by pressing [Y=] [X,T,Θ] [^] [2] [−] [3] [GRAPH] [ZOOM] [6]. Press [2nd] [TRACE] [2]. Your cursor needs to be to the left of where the graph hits the x-axis. Since it is already there, just hit [ENTER]. Then press [▶] 10 times to move the cursor to the right of where it crosses the x-axis. Hit [ENTER]. For a guess, you can just hit [ENTER] again. (Result is X=1.7320508 and Y=0)



minimum: To find the lowest point on a graph, use the minimum key. The process is similar to that of finding the zero in that you must go to the left of the minimum, press [ENTER], go to the right of the minimum, press [ENTER], make a guess, and press [ENTER].

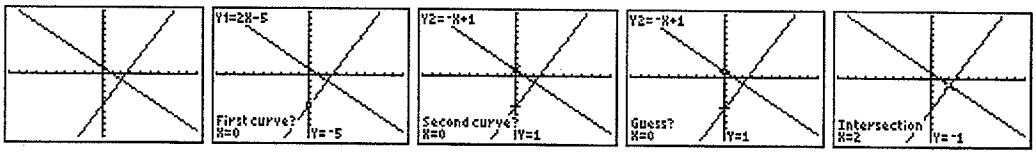
Example: On the same graph above, Hit [2nd] [TRACE] [3]. Hit [◀] until you are to the left of the lowest point. Hit [ENTER]. Then, hit [▶] until you are to the right of the lowest point. Press [ENTER] [ENTER]. You should see X = ⁻1.269E⁻6 Y= ⁻3. The number ⁻1.269E⁻6 is the calculator's version of the number ⁻0.000001269. (See Scientific Notation.) If we consider round off error, the actual answer should be X = 0, Y = ⁻3.



maximum: To find the highest point, use the maximum key. The keystrokes are basically the same. Note the previous example has no maximum.

intersect: If you have 2 or more graphs showing you can find where they intersect. When you pick this option, it will ask you "First curve?" while blinking on one of the graphs. Hit [ENTER]. If you need to, use the up and down arrows to get to the second graph. Hit [ENTER] [ENTER].

Example: To find the intersection point of $y = 2x - 5$ and $y = -x + 1$, hit: [Y=] [2] [X,T,Θ] [−] [5] [ENTER] [(-)] [X,T,Θ] [+] [1] [GRAPH] [2nd] [TRACE] [5] [ENTER] [ENTER] [ENTER]. Note that the answer is the point (2, -1).



TABLES - TI 82/83/83Plus

Table: Along with the graphing functionality, the TI 82/3 has table related keys. This will produce a standard input-output table for the functions stored under the [Y=] menu.

Example: Type in y = 3x – 1. ([Y=] [3] [X,T,Θ] [–] [1] [ZOOM] [6].) Hit [2nd] [GRAPH] (TABLE). You should see the table that is below left. (If you do not see the same table, see **Table Setup** below the tables, or try the arrow keys as described next.) Note that the up and down arrows ([▲] [▼]) allow you to move up or down to get to larger or smaller values. If you wanted to see the y-value when x is 10, scroll down to 10 in the x-column and you will see 29 for y.

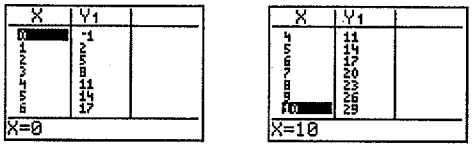
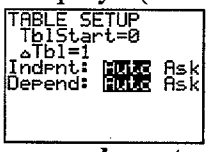
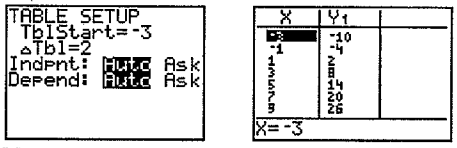


Table Setup: To change the first x-value in the table or the amount that x goes up by in the table, use the [2nd] [WINDOW] (TBLSET) key. You will see a screen similar to the one below. Tblstart is the starting x-value for a table. (0 for the above left table.) ΔTbl is the amount that each successive x goes up by. (1 for the above tables.)



****Note: After your table is setup you have to get back to the table with the [2nd] [GRAPH] (Table) key.**

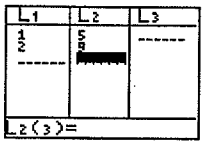
Example: To start a table for y = 3x-1 at x = -3 and pick only odd x-values (thus going up by 2), we would do the following. [2nd] [WINDOW] [(-)] [3] [ENTER] [2] [2nd] [GRAPH]. The two screens for this are shown below.



REGRESSION CURVES AND STAT PLOTS – TI 82/83/83Plus

Entering Data: To enter data, press the [STAT] button. Under this menu, you will want to edit lists by pressing [ENTER] or [1]. Enter your independent (x) or input data under list 1 (L_1). Enter your dependent (y) or output data under list 2 (L_2).

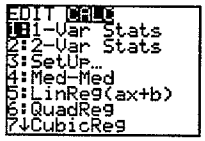
Example: Once you are in the lists, enter the following data:



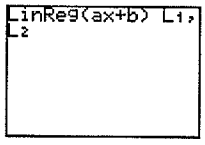
Clearing Data: If there is data under a list (L_1, L_2, etc.) that you wish to clear, go into STAT and EDIT. Then, use your arrow keys to move up and highlight the list name you wish to clear. (If you want to clear L_1, L_1 should be highlighted.) Then, press [CLEAR] and [ENTER].

Finding the Equation of the Regression Curve :

- To find the equation of a regression line or curve, you must first press [STAT].
- You now want to calculate (CALC) the equation, so you must use your right arrow key ([▶]) to highlight CALC.

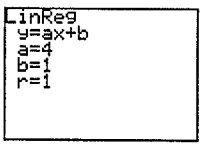


- Then, you must find the regression option (such as LinReg for linear regression) and press the appropriate number, or press ENTER if the option is highlighted. You should now see your choice on the home screen.
- Now, you can enter the lists for which you wish to find the regression equation. Press [2nd], then the appropriate list number ([1] for L_1, etc.) for your input data. Then, press [,]. Then, enter the output data list (usually L_2) following the previous steps.



- Finally, press [ENTER].
- The "r" is the correlation coefficient.

Example: The linear regression equation (LINR) found below for the points (1, 5) and (2, 9) is $y = 4x + 1$

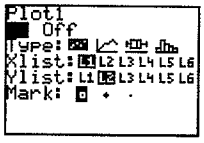


Turning on the Diagnostics: (on the TI-83 or TI-83Plus): If you do not see the correlation coefficient, r, when you find your regression equation, you must turn your diagnostics on. To do so, press [2nd], then [0] (Catalog). Using your down arrow ([▼]), scroll down to DiagnosticOn and press [ENTER] twice.

Plotting the Data:

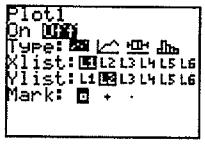
- To plot the data points, you must first press [2nd], then [Y=] (Statplot).

- Press [ENTER] to use Plot1.
- Make sure that ON has a blinking highlight and press [ENTER].
- Be sure that all options are appropriate: the picture highlighted should be the first graph with dots, the Xlist should highlight your input data list (usually L1), the Ylist should highlight your output data list (usually L2), and the Mark is your preference. Use the [ENTER] key to highlight the appropriate choices.



- Press [ZOOM], then [9]. (This is the ZoomStat option.) The calculator will find the appropriate viewing window for the data.

- **IT IS EXTREMELY IMPORTANT TO TURN OFF THE PLOT WHEN YOU ARE FINISHED WITH IT TO AVOID ERROR MESSAGES!!!** (You can do so by going back into StatPlot (by pressing [2nd] [Y=]) and PLOT1 (by pressing [ENTER]). Then, highlight OFF using your right arrow key ([▶]) followed by pressing [ENTER]. Recall, pressing [2nd] [MODE] (QUIT) will return you to the "home" screen.



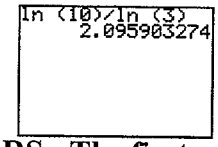
LOGARITHMS, EXPONENTS, AND TRIGONOMETRY – TI 82/83/83Plus

Calculating the Logarithm of a Number: Two keys on your calculator allow you to calculate the log of a number: [LOG] (the common log or log base 10) and [LN] (the natural log or log base e).

Example: To calculate $\log(90)$, simply press [LOG] [9] [0] [ENTER]. (Result ≈ 1.95)

Finding the Logarithm of a Number if the Base is not 10 or *e*: If you are dealing with a logarithm with a base besides 10 or e, you must use the change of base formula to find the logarithm.

Example: To calculate $\log_3(10)$, you must find the quotient of ln(10) and ln(3) by pressing [LN] [(] [1] [0] [)] [÷] [LN] [(] [3] [)] [ENTER]. (Result ≈ 2.0959)



**NOTE TO TI-83 USERS: The first parenthesis is supplied by the calculator.

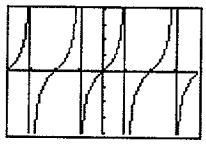
Calculating *e* Raised to a Power: The e^x option is located "behind" the [LN] key.

Example: To calculate e^2, press [2nd] [LN] [2] [ENTER]. (Result ≈ 7.389)

Degree and Radian Mode for Trigonometry: It is common to have to alternate between radian and degree mode for angles in trigonometry. The default of the calculator is radian mode. To switch to degree mode, press the [MODE] key. Then, use your down arrow ([▼]) and right arrow key ([▶]) to highlight Degree. Once it is highlighted press [ENTER]. You may now press [2nd] [MODE] (QUIT) to get back to the home screen. Similarly, you may follow the steps and highlight Radian to switch back to radian mode.

Graphing Trigonometric Functions: You may follow the general graphing directions on page 3 of the manual to graph trigonometric functions. One special feature that is helpful is "ZOOMTRIG or ZTrig". Once you have entered your function under the "Y=" menu, you may press [ZOOM], then [7] for ZTrig. This option will graph your function in an appropriate window. It will also allow you to "TRACE" with appropriate "x" values.

Example: To graph the function $y = \tan(x)$, press [Y=] [TAN] [(] [X,T,Θ] [)]. Then, press [ZOOM] [7].



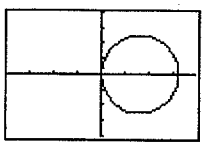
**NOTE: THE VERTICAL LINES IN THE GRAPH REPRESENT ASYMPTOTES AND ARE NOT PART OF THE FUNCTION'S GRAPH!

OTHER GRAPHING – TI 82/83/83Plus

Graphing Using Polar Coordinates: Often times, we graph relationships that are not functions using polar coordinates. To graph using these coordinates, we must change the mode of the calculator and enter the equation in a similar manner to previous graphing entries.

- To change the calculator into polar coordinate mode, press [MODE]. Then, use your down arrow key ([▼]) and right arrow key ([▶]) to highlight "Pol". Press [ENTER].
- Now, you are ready to enter your function by pressing [Y=]. You will now be entering an equation for "r" in terms of "θ".

  Example: To enter $r = 5\cos(\theta)$, press [5] [COS] [(] [X,T,Θ] [)]. Then, press [GRAPH] or [ZOOM] [7] (for ZoomTrig). Below is an example of your graph if you use ZoomTrig.

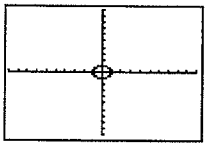


- It is important to make sure all "WINDOW" options are appropriate for your graph. After pressing [WINDOW], you will see options for θmin, θmax, and θstep. These options allow you to set the amount of your graph that is shown. The smaller the θstep chosen, the more smooth the curve will look (and longer the picture will take to graph).

Graphing Using Parametric Equations: We also use parametric equations to graph relationships that are not functions (such as circles). Again, we must change the mode of the calculator and enter the equations in a similar manner to previous graphing entries.

- To change the calculator into parametric equation mode, press [MODE]. Then, use your down arrow key ([▼]) and right arrow key ([▶]) to highlight "Par". Press [ENTER].
- Now, you are ready to enter your function by pressing [Y=]. You will now be entering equations for "x" and "y" in terms of "T".

  Example: To enter the unit circle, you must enter $x = \cos(T)$ and $x = \sin(T)$. Under X_{1_T}, press [COS] [(] [X,T,Θ] [)]. Under Y_{1_T}, press [SIN] [(] [X,T,Θ] [)]. Then, press [GRAPH].



- It is important to make sure all "WINDOW" options are appropriate for your graph. After pressing [WINDOW], you will see options for Tmin, Tmax, and Tstep. These options allow you to set the amount of your graph that is shown. The smaller the Tstep chosen, the more smooth the curve will look (and longer the picture will take to graph).

MATRICES – TI 82/83/83Plus

***Note to 83 Plus users: Wherever you see [MATRX] in these instructions, you should do [2nd] [MATH].**

Matrices: Matrix operations on the TI 82/3 are controlled by the menus under the [MATRX] key. There are three parts to the matrix menu.

NAMES: The TI names matrices A, B, C, etc. If a matrix is already stored under any name, you will see the size of the matrix listed next to its name; otherwise you will just see the names. You will use this sub menu to insert matrices into the calculator memory when you want to manipulate them.

EDIT: To enter or change matrices, use the EDIT option by pressing the right arrow key ([▶]) twice. If you hit enter to pick A, you may then see something similar to the picture below. It depends on whether you had a matrix stored there already. You pick the dimensions, and then enter the individual elements, row by row.

Example: To enter the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ into name A, you would hit [MATRX] [▶] [▶] [1] [3] [ENTER] [3] [ENTER] [1] [ENTER] [2] [ENTER] [3] [ENTER] [4] [ENTER] [5] [ENTER] [6] [ENTER] [7] [ENTER] [8] [ENTER] [9] [ENTER]

Use of Matrices: To use the matrix you need to quit the editing mode first by pressing [2nd] [MODE] (QUIT); **DO NOT** just hit [MATRX] from the editing mode. To enter the matrix that we just input, hit [MATRX] [1]. It shows on the screen as [A]. If you hit enter it looks similar to a regular matrix. You may use matrices for all the regular operations.

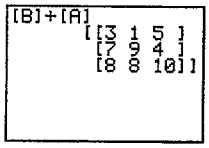
Scalar Multiplication: To multiply $6\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, hit [6] [×] [MATRX] [1] [ENTER]. You should get the matrix shown below left.

```
6*[A]
     [[6   12  18]
      [24  30  36]
      [42  48  54]]
```

```
[A]*[B]
          [[14]
           [32]
           [50]]
```

Matrix Multiplication: To multiply $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, we must first store the second matrix as [B]. Hit [MATRX] [▶] [▶] [2] [3] [ENTER] [1] [ENTER] [1] [ENTER] [2] [ENTER] [3] [ENTER] [2nd] [MODE] [MATRX] [1] [×] [MATRX] [2] [ENTER]. You should get the matrix shown above right. Note if you try to multiply in the opposite order, it won't work since the dimensions do not match up correctly.

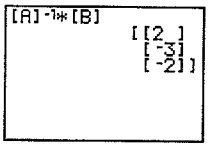
Matrix Addition: To add $\begin{bmatrix} 2 & -1 & 2 \\ 3 & 4 & -2 \\ 1 & 0 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, we must first store the first matrix as [B]. Hit [MATRX] [▶] [▶] [2] [3] [ENTER] [3] [ENTER] [2] [ENTER] [(-)] [1] [ENTER] [2] [ENTER] [3] [ENTER] [4] [ENTER] [(-)] [2] [ENTER] [1] [ENTER] [0] [ENTER] [1] [ENTER] [2nd] [MODE] [MATRX] [2] [+] [MATRX] [1] [ENTER]. The answer is below.



Inverses: To find the inverse of a matrix, use the [x^{-1}] key. The matrix must be square and not have a determinant of 0. To find the inverse of $C = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, you would do the following. [MATRX] [▶] [▶] [3] [2] [ENTER] [2] [ENTER] [2] [ENTER] [3] [ENTER] [1] [ENTER] [2] [ENTER] [2nd] [MODE] [MATRX] [3] [x^{-1}] [ENTER] (Result is $C^{-1} = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$)

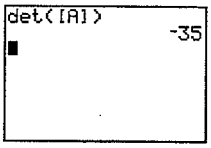
Solving Systems: To solve a system of n equations in n unknowns, let [A] be the coefficient matrix, and [B] be the constant matrix, and then find [$A^{-1}B$].

Example: To solve the system $\begin{Bmatrix} 4x + y - 3z = 11 \\ 2x - 3y + 2z = 9 \\ x + y + z = -3 \end{Bmatrix}$, the coefficient matrix [A] is $\begin{bmatrix} 4 & 1 & -3 \\ 2 & -3 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ and the constant matrix [B] is $\begin{bmatrix} 11 \\ 9 \\ -3 \end{bmatrix}$. To find $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, you hit:
[MATRX] [▶] [▶] [1] [3] [ENTER] [3] [ENTER] [4] [ENTER] [1] [ENTER] [(-)] [3] [ENTER] [2] [ENTER] [(-)] [3] [ENTER] [2] [ENTER] [1] [ENTER] [1] [ENTER] [1] [ENTER] [2nd] [MODE] [MATRX] [▶] [▶] [2] [3] [ENTER] [1] [ENTER] [1] [1] [ENTER] [9] [ENTER] [(-)] [3] [ENTER] [2nd] [MODE] [MATRX] [1] [x^{-1}] [×] [MATRX] [2] [ENTER]. The answer is x = 2, y = -3, z = -2



Determinants: To find a determinant of a matrix, use [MATRX] [▶] [1], put in the matrix name, and then hit [ENTER].

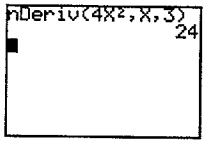
Example: The determinant of $[A] = \begin{bmatrix} 4 & 1 & -3 \\ 2 & -3 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ is found by [MATRX] [▶] [1] [MATRX] [1] [ENTER]. (Result = -35)



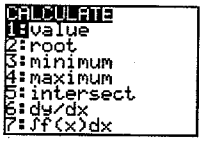
DERIVATIVES AND INTEGRALS – TI 82/83/83Plus

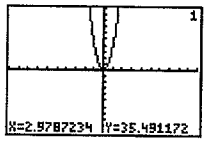
Approximating the Numerical Derivative: The TI calculator allows you to find the derivative of a function at a point using the "nDeriv(" command. This command is located under the [MATH] menu at number 8. Once you obtain the command, you must enter the function you are differentiating, followed by the variable with which you are differentiating, followed by the value. (Be sure to place commas between these items.)

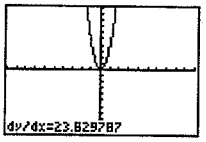
Example: To find the derivative of $y = 4x^2$ at $x = 3$, press [MATH] [8] (nDeriv) [4] [X,T,Θ] [x^2] [,] [X,T,Θ] [,] [3] [)] [ENTER]



Alternate Option for the Numerical Derivative: You may also find the derivative of a function at a point after you graph the function. To do so, first graph the function. (Try graphing $y = 4x^2$ from the previous example.) Then, go into the CALC menu by pressing [2nd] [TRACE]. Press [6] for "dy/dx". Use your right and left arrow keys to find the x-value for which you wish to find the derivative and press [ENTER].

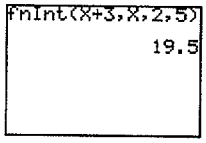




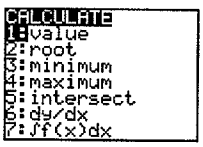


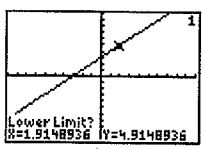
Approximating a Definite Integral: The TI calculator allows you to find a definite integral using the "fnInt(" command. This command is located under the [MATH] menu at number 9. Once you obtain the command, you must enter the function you are integrating, followed by the variable with which you are integrating, followed by the limits of integration. (Be sure to place commas between these items.)

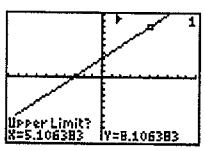
Example: To find $\int_2^5 (x+3)dx$, press [MATH] [9] (fnInt) [X,T,Θ] [+] [3] [,] [X,T,Θ] [,] [2] [,] [5] [)] [ENTER].

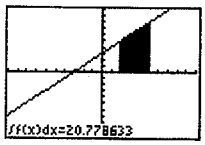


Alternate Option for the Definite Integral: You may also find the definite integral after you graph the function. To do so, first graph the function. (Try graphing $y = x + 3$ from the previous example.) Then, go into the CALC menu by pressing [2nd] [TRACE]. Press [7] for "$\int f(x)dx$". Use your right and left arrow keys to find lower limit of the definite integral, press [ENTER], use the right arrow key to find the upper limit, and press [ENTER].



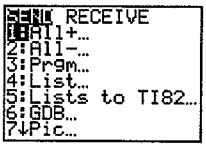






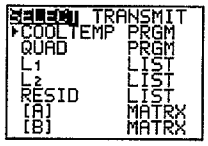
LINKING – TI 82/83/83Plus

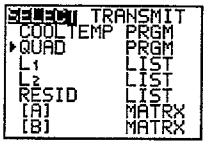
Linking: To send information from one calculator to another, you only need a linking cable. If you wish to send information to and from a computer, you need the linking software (available online from TI) and you need the calculator-serial port cable which is available for purchase form TI. These directions cover calculator-to-calculator linking. First attach the link cable to both calculators. Make sure the cable is pushed in firmly. Linking is controlled from the LINK menu, which is accessed with [2nd] [X,T,Θ] (LINK). That accesses the following menu.

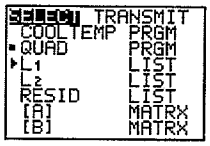


RECIEVE: On the receiving calculator, you first hit [2nd] [X,T,Θ] (LINK). Then you want to use the right arrow key to move to RECEIVE. There is only one option, Receive. Hit [1] or [ENTER], and it should start waiting for information to be sent.

SEND: On the sending calculator, you have the menu shown above. Usually the most flexible way to proceed is to pick [2]: **All-...** You then pick which items you want sent. A picture of a typical screen is shown below left. Each calculator will look a little different.







If you wanted to send the program QUAD you would go down to that row so that the arrow is pointed at QUAD and then hit [ENTER] (above middle). If you move down another row, you can see that a little square is in front of QUAD (above right). That means it has been selected, and it is ready for transfer. You may also select any others you wish to send. Then move the cursor to the right to TRANSMIT and hit [1] or [ENTER].