Calculator Keystroke Manual for the TI-83 and TI-83Plus

Preliminary Edition

to accompany the

Maricopa Mathematics Modules

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Contents

Introduction

The graphing calculator is a tool to enable students to visualize mathematics, solve problems, think critically, and develop a conceptual understanding of the mathematics being studied. This Calculator Keystroke Manual is to provide students with a reference manual for using a graphing calculator. The intent is to allow students to focus on learning mathematics and for teachers to teach mathematics rather than the focus being on pushing buttons. It is written so that it can be referenced whenever a particular calculator function is desired. Each function, listed in alphabetical order, contains a step-by-step approach with calculator screen shots displaying what should be seen after each step. Occasionally, sample problems are given and worked through to better display that calculator function. Anytime a particular calculator button is referenced, the button name will be typed in all CAPS. If a 2nd function is referenced, the main button name is used with the actual function desired typed in parenthesis. For example, to turn the calculator OFF, type 2nd ON (OFF).

This manual does not provide instructions on using every function available on the calculator. With this background and subsequent mathematics courses, students will continue to develop their ability to use the calculator as an effective and efficient tool for doing mathematics.

Before beginning, be sure that the calculator is prepared correctly.

Preparing the Calculator

1. Press MODE. For the purposes of this manual, all settings on the left hand side of the screen should be highlighted. If something is not set properly, use the UP, DOWN, LEFT and RIGHT keys to move the cursor to the desired location. Press ENTER to highlight the appropriate setting.

2. Press 2nd Y= (STAT PLOT). Use the DOWN arrow key to move the cursor to option 4:PlotsOff. Press ENTER.

3. The HOME SCREEN is the main screen where most calculations are done.

Using this manual

A good way to use this manual is to complete each of sections in the order given, then use the manual as a reference when needed.

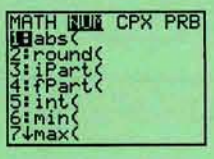
1. ON/OFF
2. Contrast
3. ANS (Answer)
4. DEL/INS (Delete/Insert)
5. ENTRY
6. Square Root
7. Exponents
8. Scientific Notation
9. QUIT
10. Fractions
11. Y=
12. ZOOM/WINDOW
13. Trace
14. Tables
15. Absolute Value
16. Value
17. Evaluate a Function
18. Intersect
19. ZERO
20. One Variable Statistics
21. Histograms
22. Box and Whisker Plots
23. REGRESSION/Scatter Plots/Lists
24. Error Messages
25. Trigonometric Functions
26. Time Value of Money (TVM)

Absolute Value

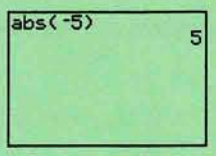
The absolute value of a number always returns the positive value of that number. The absolute value function can be performed numerically in the home screen or can be graphed as a function in the y= screen.

Example: Determine the absolute value of –5.

1. From the home screen, press MATH, press the RIGHT ARROW to highlight the NUM menu, and select 1: abs(

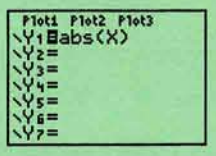


2. Enter –5 in the parentheses. Be sure to use the negative button (-) not the blue minus button.

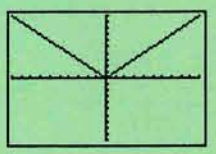


Example: Graph $Y_1 = |x|$.

3. Press Y= and enter Y_1 = abs(x). Follow the previous instructions for accessing the abs(command.



4. Press ZOOM 6: ZStandard to graph the function in the standard viewing window.

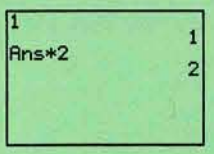


ANS

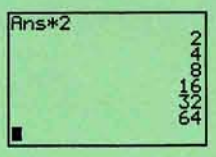
The ANS function recalls the previous answer so that additional operations can be performed on the answer to a previous operation.

Example: Start with the number 1 and continue to double it indefinitely.

1. Enter the number 1 and press ENTER. Press the multiplication button (×) then press 2 and ENTER. The ANS part of the display refers to the previous answer, in this case the 1 that was entered initially.

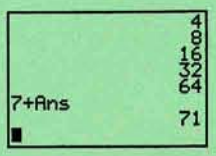


2. Continue to press ENTER until reaching the answer 64. Each time, the calculator takes the previous answer and multiples by 2.



The ANS function can be accessed by typing 2^{nd} (-) (ANS).

3. Press 7, press +, press 2nd (-) (ANS), then ENTER. The calculator takes the last answer (64), adds 7, and returns the answer of 71.



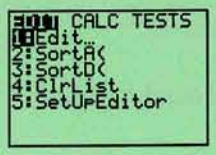
Box and Whisker Plots

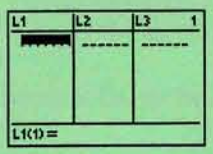
Box and whisker plots are used to display and compare data. Create a box and whisker plot for the data given.

The ACT scores for some students in a particular school is given.

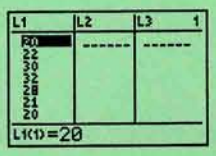
Student	1	2	3	4	5	6	7	8	9
ACT Score	20	22	30	32	28	21	20	34	18

1. Press STAT and select 1: EDIT.

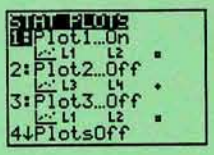


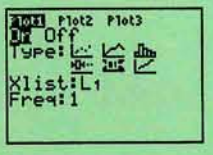


This will take you to the TI version of a spreadsheet called Lists. If data already is entered into the lists, you can clear it by using the UP ARROW to highlight the L1 at the very top of the screen. When highlighted, press CLEAR and ENTER. Repeat for L2, etc.
Enter the data into the lists by typing in the appropriate numbers and pressing ENTER after each entry. For this example, enter only the ACT scores into L1.

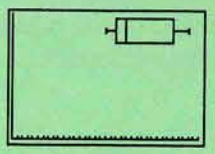


2. Set up the plot by pressing 2nd Y= (STAT PLOT). Choose Plot 1, 2, or 3. Make sure that the plot is turned ON, the type is Box and Whisker (2nd to the last choice), the Xlist is the list containing the data (L_1 in this case), and the frequency (Freq) is 1.

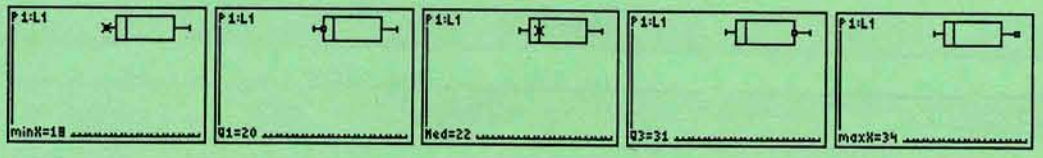




3. Adjust your WINDOW so that it reflects the values entered into the lists. For a Box and Whisker plot, only the Xmin and Xmax must reflect the data. The Ymin and Ymax are irrelevant.



4. Use the TRACE command and your RIGHT and LEFT ARROW keys to find the minimum data value, first quartile, median, third quartile, and maximum data value.



Contrast

The contrast for the calculator screen can be adjusted to be darker or lighter. As your batteries become older, it will become necessary to adjust the contrast so that you can more easily read the calculator screen.

1. Press 2nd and release.

2. Hold the DOWN ARROW key to make the screen lighter. Hold the UP ARROW key to make the screen darker. Each time the DOWN or UP ARROW key is released, the 2nd key must be pressed again to continue to adjust the contrast.

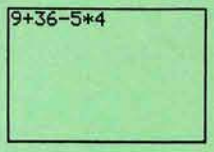
3. As the UP or DOWN ARROW keys are held, notice the number in the upper right hand corner. The contrast is measured from 1 – 9 where 1 is the lightest setting and 9 is the darkest. If the contrast needs to be 9 in order for you to see the screen, you probably need to replace the batteries.

DEL/INS

The DEL (Delete) key deletes the character under the current cursor location. The 2nd DEL (INS) (Insert) key inserts a character to the left of the current cursor location.

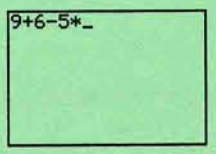
Example: You desire to type 9+6-5*34, but accidentally type 9+***36***-5***4***.

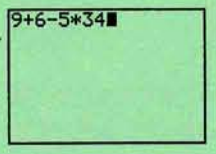
1. Enter 9+***36***-5***4***. Use the LEFT arrow to move the cursor to the 3 location.



2. Press DEL. This deletes the unneeded 3.

3. Use the RIGHT ARROW to move the cursor to the 4 location. Press 2nd DEL (INS) and enter a 3. This inserts the 3 to the left of the 4 as desired. Notice that the cursor changed after pressing 2nd DEL (INS) so that you knew that the calculator was in the insert mode.





ENTRY

The ENTRY function returns previously entered operations on the calculator screen so that you may edit them.

1. Press 2nd ENTER (ENTRY). The last operation entered into the computer appears on the screen and the cursor is at the right end of the line. Use the UP, DOWN, RIGHT, LEFT arrow keys to edit the line.

2. Press 2nd ENTER (ENTRY) again. Continue to press 2nd ENTER (ENTRY) and notice that previous entries continue to be restored on the screen. Any one of them can be edited.

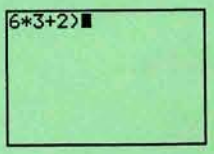
Error Messages

Occasionally, error messages are given to indicate some problem with the function you are asking the calculator to perform. Three common error messages and how to correct them are provided.

Syntax Error
Syntax refers to the way in which the function or command was entered. One common error deals with use of parentheses.

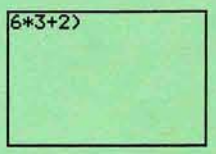
Example: You intend to enter 6*(3+2) but accidentally enter 6*3+2)

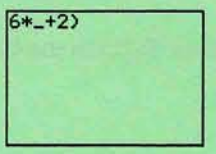
1. In the Home Screen, enter 6*3+2) and press ENTER.

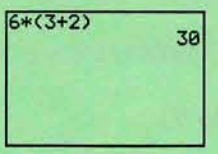


2. Because of the missing opening parenthesis, the calculator returns a syntax error. Notice the options on the screen. You can QUIT and start over, or you can GOTO the error so that it can be corrected. Select GOTO by pressing ENTER or the number 2.

3. To correct the mistake, insert a parenthesis before the 3 using INS. Press ENTER.





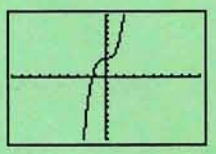


Window Range Error
The Graph Window Error refers to an incorrect WINDOW entry.

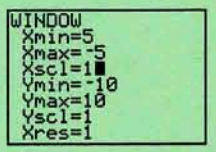
1. Enter an equation into Y=.

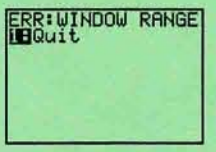
For example: $Y_1=x^3 + 3$

2. Press ZOOM 6: ZStandard to graph the function in the standard viewing window.

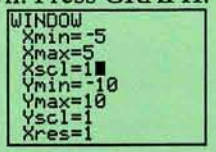


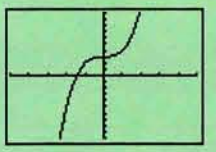
3. Press WINDOW. Imagine that you incorrectly changed the WINDOW as shown below. Press GRAPH. A WINDOW RANGE Error occurs.





4. The only option is to QUIT. To correct the error, press WINDOW and change the Xmin and Xmax as shown. Press GRAPH.





Dimension Mismatch Error (DIM MISMATCH)
The Dimension Mismatch error results when the data entered in the Lists do not match up. That is, there is more data entered in one list than in the other.

1. When DIM MISMATCH is encountered, the only option is to QUIT (Option 1).

2. Press QUIT. To correct the error, refer to Preparing the Calculator, step 2.

Evaluate a function

One way to evaluate a function is to use the notation $Y_1(x)$ in the home screen.

1. Enter an equation into Y_1.

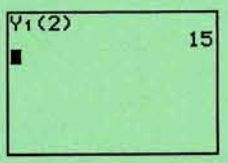
   Example: $Y_1 = 2x^2 + 3x + 1$

2. Press 2^{nd} MODE (QUIT) to return to the home screen.

3. Press VARS, arrow across to the right to Y-VARS and select option 1:Function.

4. Since the equation was entered in Y_1, select option 1: Y_1. Type a left parenthesis, enter a value for x, close the parenthesis and press ENTER.

   Example: $Y_1(2)$



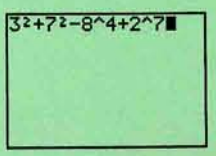
5. If many evaluations need to be completed, press 2^{nd} ENTER (ENTRY) to repeat the previous entry, then use arrows to move the cursor over the value of x that needs to be changed and type in a new value for x and press ENTER.

Exponents

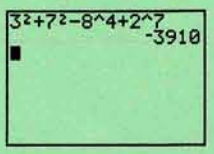
Exponents of power 2 can be entered into the calculator 2 different ways. Exponents of 2 or greater are entered using the caret key.

Example: Evaluate $3^2 + 7^2 - 8^4 + 2^7$.

1. To enter the powers of 2, use the x^2 key that is located in the middle of the first column of keys. To enter powers of 2 or greater, use the caret key (^) which is located below the CLEAR key in the last column.



2. Press ENTER.

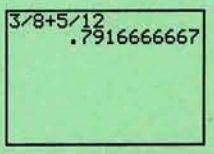


Fractions

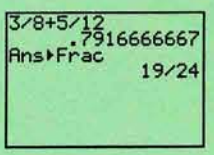
The TI-83 can convert from fractions to decimals and from decimals to fractions.

Example: Add $\frac{3}{8}+\frac{5}{12}$. Write your answer as a fraction.

1. Enter 3/8 + 5/12 and press ENTER. The fraction bar (/) is the division symbol on the keypad.

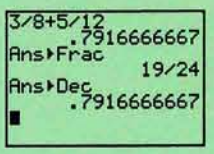


2. To change the answer from a decimal to a fraction, press MATH and select option 1: ▶Frac.



Note: See the ANS section if you don't know what Ans means.

3. To convert the fraction back to a decimal, press MATH and select option 2: ▶Dec.



This screen shows that the fraction $\frac{19}{24}$ is equivalent to the decimal .7916666667.

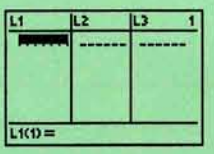
Histograms

Histograms are a way to display and analyze data. Create a histogram for the data given.

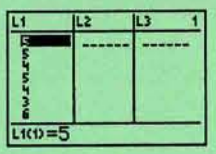
The shoe size of some the children in the class is shown.

Child	1	2	3	4	5	6	7	8	9
Shoe Size	5	5	4	5	4	3	6	5	4

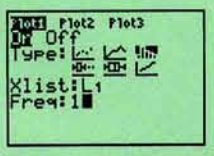
1. Press STAT and select 1: EDIT.



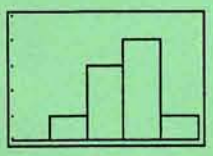
This will take you to the TI version of a spreadsheet called Lists. If data already is entered into the lists, you can clear it by using the UP ARROW to highlight the L1 at the very top of the screen. When highlighted, press CLEAR and ENTER. Repeat for L2, etc.
Enter the data into the lists by typing in the appropriate numbers and pressing ENTER after each entry. For this example, enter only the shoe sizes into L1.



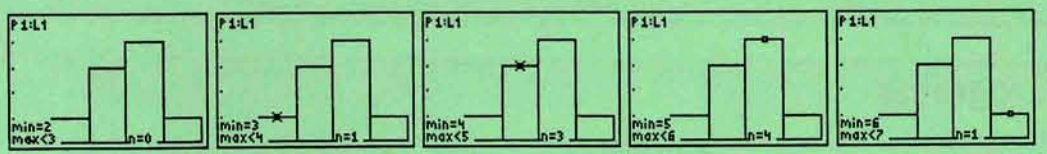
2. Set up the plot by pressing 2nd Y= (STAT PLOT). Choose Plot 1, 2, or 3. Make sure that the plot is turned ON, the type is Histogram (3rd choice), the Xlist is the list containing the data (L_1 in this case), and the frequency (Freq) is 1.



3. Adjust your WINDOW so that it reflects the values entered into the lists. The Ymin should be set at 0 because 0 is the least number of times a particular shoe size is seen. Ymax should be set at 5 since the largest number of times a particular shoe size is seen is 4 (4 children wear size 5 shoes).



4. Use the TRACE command and your RIGHT and LEFT ARROW keys to find the frequency of each shoe size.



intersect

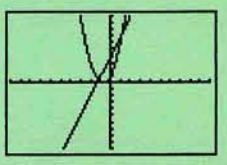
The Intersect function will calculate an intersection point of two graphed equations.

1. Enter the equations in Y_1 and Y_2.

Example: $Y_1 = 2x^2 + 3x + 1$
$Y_2 = 3x + 4$

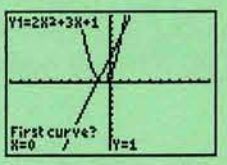
2. Select an appropriate viewing window. In this case the standard viewing window may be used (ZOOM 6).

3. Either press GRAPH or ZOOM 6.

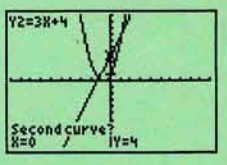


4. To determine the first quadrant point of intersection for these two graphs, press 2nd TRACE (CALC) and select option 5 (intersect).

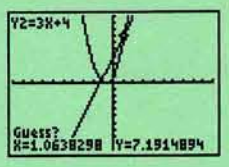
5. Automatically returning to the graph screen, the calculator asks for the First curve. The First curve is the function defined in Y_1. At the top of the screen, the equation entered into Y_1 should be showing. If it is, press ENTER. If not, press either the UP or DOWN arrow to switch to that equation, then press ENTER.



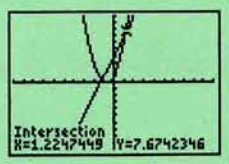
6. The calculator now asks for the Second curve. The Second curve is the function defined in Y_2. At the top of the screen, the equation entered into Y_2 should be showing. If it is, press ENTER. If not, press either the UP or DOWN arrow to switch to that equation, then press ENTER.



7. The calculator next asks for a guess as to where the point of intersection you are looking for is located on the graph. Use the LEFT and RIGHT arrow keys to move the cursor to the place where the graphs intersect in the first quadrant (in this example).



8. The calculator will show the point of intersection at the bottom of the screen.



Lists – See Regression

ON/OFF

1. Press ON to turn the calculator on.

2. To turn the calculator off, press 2^{nd} ON (OFF).

After several minutes of inactivity, the calculator will automatically shut off.

One-Variable Statistics

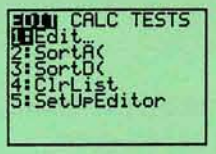
The 1-Variable Statistics command returns the following statistics: mean ($\bar{x}$), sum of x ($\sum x$), sum of the squares of x ($\sum x^2$), sample standard deviation (Sx), population standard deviation (σx), the amount of data entered (n), the minimum data value (minX), the first quartile (Q1), the median (Med), the third quartile (Q3), and the maximum data value (maxX).

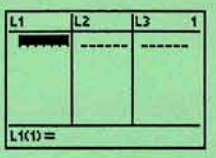
Example: Determine all of the one-variable statistics for the following data set.

The ACT scores for some students in a particular school is given.

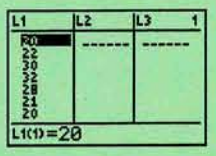
Student	1	2	3	4	5	6	7	8	9
ACT Score	20	22	30	32	28	21	20	34	18

1. Press STAT and select EDIT (option 1).

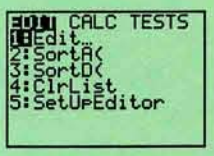


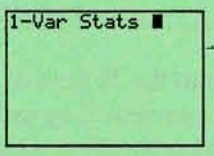


This will take you to the TI version of a spreadsheet called Lists. If data is already entered into the lists, you can clear it by using the UP ARROW to highlight the L_1 at the very top of the screen. When highlighted, press CLEAR then ENTER. Repeat for L_2, etc.
Enter the data into the lists by typing in the appropriate numbers and pressing ENTER after each entry. For this example, enter only the ACT scores in L_1.

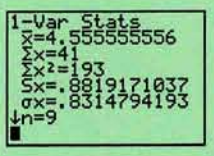


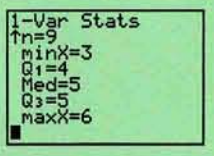
2. Press STAT; use the RIGHT ARROW to access the CALC menu. Select option 1:1-Var Stats. Press ENTER.





3. Notice the arrow at the bottom of the screen. This indicates that there is more information to be seen. Use the DOWN ARROW to view this information.





QUIT

This returns the calculator to the home screen from any other menu.

Example: Imagine that you are in the WINDOW screen and need to get back to the home screen.

1. Press WINDOW. To go back to the home screen, press 2nd MODE (QUIT).

Regression

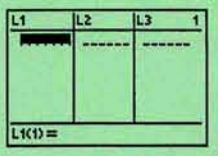
The regression feature creates a mathematical model for data that has been entered in the Lists. For example, create a scatter plot and a mathematical model for the set of data given.

The revenue for Dell Computer Corporation from 1985 through 1993 is listed in the table. The revenue is given in millions of dollars.

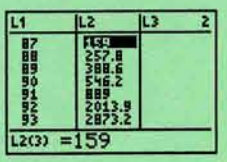
Year	1985	1986	1987	1988	1989	1990	1991	1992	1993
Revenue	33.7	69.5	159.0	257.8	388.6	546.2	889.0	2013.9	2873.2

(Source: Dell Computer Corporation)

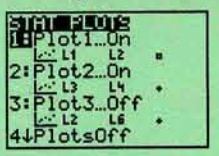
1. Press STAT and select EDIT (option 1).

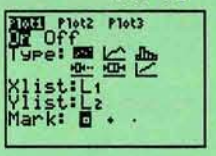


This will take you to the TI version of a spreadsheet called Lists. If data is already entered into the lists, you can clear it by using the UP ARROW to highlight the L_1 at the very top of the screen. When highlighted, press CLEAR then ENTER. Repeat for L_2, etc.
Enter the data into the lists by typing in the appropriate numbers and pressing ENTER after each entry. For this example, enter only the last two digits of the year.

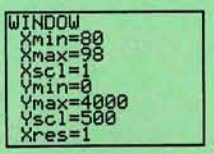


2. Set up the plot by pressing 2^{nd}Y= (STAT PLOT). Choose Plot 1, 2, or 3. Make sure the plot is turned ON, the type is scatter plot, the proper list is selected for Xlist and Ylist and the Mark is the one you want. To name your Xlist L_1 (if it isn't already), type 2^{nd} and the number 1 button.

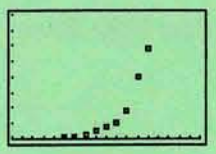




3. Adjust your WINDOW so that it reflects the values entered into your lists.

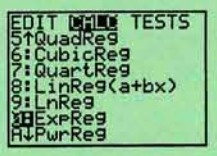


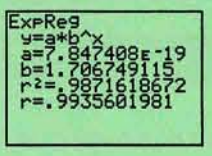
4. Press GRAPH. This graph is called a scatter plot.



5. To have the calculator calculate a model for your data, press STAT again. This time, use your RIGHT ARROW to go over to CALC. Select the appropriate model to best fit the data.

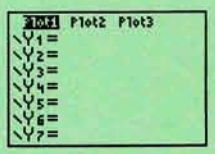
For example: Press the DOWN ARROW to move down to Option 0: ExpReg. Press ENTER. This pastes the exponential regression command into the home screen. Press ENTER. The calculator returns the exponential equation in the form $y = a*b^x$ that best fits the data.

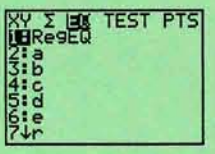




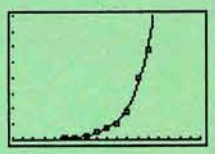
You can record this information on your paper and enter the equation in y=, or...

6. To graph the function without needing to remember or write down the regression model, press Y=. Press VARS and select option 5: Statistics. Use the RIGHT ARROW to move across to EQ and choose option 1: RegEQ. This will paste the current regression equation into Y=.





7. Press GRAPH.



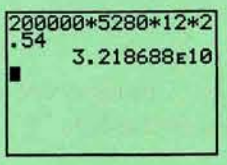
Scatter Plots – See Regression

Scientific Notation

The calculator will automatically go in to scientific notation when the result of an operation is either very small or very large.

Example: Your old automobile hit 200,000 miles on its odometer. How many centimeters is that?

1. Enter 200,000*5280*12*2.54 then press ENTER. (Note: There are 5280 feet in one mile, 12 inches in one foot, and 2.54 centimeters in one inch.)



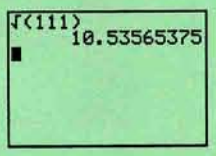
2. Notice the notation used by the calculator. The 3.210688E10 means 3.210688 x 10^{10}, or 32,106,880,000 centimeters.

Square Root

The calculator will calculate the square root of a number and return the positive root, accurate up to 11 decimal places.

Example: What is the square root of 111?

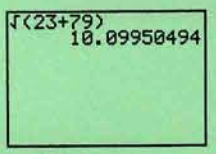
1. Enter the square root function first. Press 2^{nd} x^2 ($\sqrt{\ }$). Type then number that you which to calculate the square root, in this 111. Press ENTER.



Note: The TI-83 automatically opens the left parenthesis. Closing the parentheses is optional when taking the square root of a single number, but it is a good practice. Parentheses are needed if you need to calculate the square root of the sum or difference of numbers.

Example: What is the square root of 23 + 79?

2. Press 2^{nd} x^2 ($\sqrt{\ }$). Enter 23+79 and close the parentheses. Press ENTER.



Tables

The table feature allows the user to view a table of values when the equation of the function is entered in the Y= menu.

1. Enter an equation into Y_1.

Example: $Y_1 = 2x^2 + 3x + 1$

2. Press 2nd WINDOW (TBLSET).

3. TblStart determines where the table values will begin.

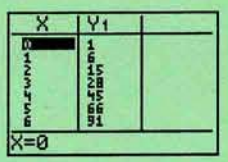
Example: TblStart=0

4. ΔTbl determines the interval between table entries. For example, if increments of one are desired, enter a 1 here.

Example: ΔTbl=1
Note: Δ is the Greek letter delta, which stands for change. So this is literally the change in the table.

5. To view a complete table of values which can be scrolled through up or down, leave the Indpnt and Depend options on Auto.

6. To view the table, press 2nd GRAPH (TABLE).



7. You can scroll up or down through the table by pressing and holding the UP or DOWN arrow keys. You must have the cursor in the X column in order to use the scrolling feature.

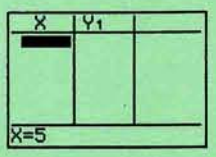
NOTE: The values in the y1 column of the table may be rounded. To get better accuracy, arrow over to the value in the y1 column and look at the bottom of the screen.

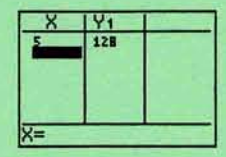
Another way to evaluate a function is to change the Indpnt option to Ask.

8. Repeat steps 2-4. This time, change the Indpnt option to Ask by using the UP, DOWN, LEFT, and RIGHT ARROWS to move the cursor to the Ask option and pressing ENTER.

9. Press 2nd GRAPH (TABLE). Enter values into the X column and the calculator will display the corresponding y-value.

Example: Find the value of the function when x = 5.





10. You can continue to evaluate the function in Y_1 by continuing to enter values for x.

Time Value of Money - TVM Solver

The TVM (Time Value of Money) Solver can be used to calculate a house or car payment, the interest rate of a loan, or other financial options. The TVM is not available on the TI-82, 85, or 86.

For example, consider the following situation. A house is purchased for $85,000 financed for 30 years at 8.5% interest. What will the monthly payment be on this mortgage?

1. Press 2^{nd} x^{-1} (FINANCE). Select Option 1:TVM Solver....

NOTE FOR TI-83 PLUS CALCULATORS: To access the FINANCE menu, press APPS and select Option 1: Finance. Then select Options 1:TVM Solver.

2. Enter N (number of payments). In this situation, N = 360 since the mortgage is for 30 years and 12 payments will be made each year.

3. Enter I%. This is the interest rate and should be entered as a percentage. In this situation, I%=8.5.

4. Enter PV. This is the present value of the loan, 85000 in this situation.

5. Skip PMT and arrow down to FV. Enter FV. This is the future value of the loan which is 0 (the loan is paid off).

6. Enter P/Y. This is the number of payments per year. In this situation, payments will be made each month, so P/Y=12.

7. Enter C/Y. This is the number of compounding periods per year. Use C/Y=12 for this situation.

8. Select PMT. This tells when the payment will be made, at the end (END) or the beginning (BEGIN) of the month. For this situation, use BEGIN.

9. To calculate the monthly payment in this situation, arrow up to the PMT: line. Press ALPHA ENTER (SOLVE) and the monthly payment will be calculated. It will appear as a negative value because the calculator considers it a payment made (outflow of cash).

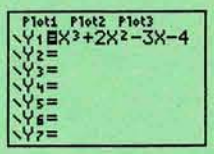
10. If other information was unknown rather than the monthly payment, simply enter the known values, move the cursor to the unknown value and press ALPHA ENTER (SOLVE) to solve for that unknown value.

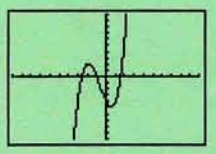
TRACE

The TRACE features allows you to trace along the graph of a function and view the coordinates of the pixels at the bottom of the screen.

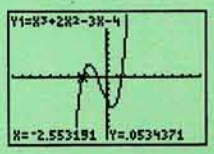
> Example: Graph the function $y = x^3 + 2x^2 - 3x - 4$ and use the TRACE feature to approximate the x-intercepts of the graph.

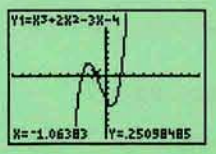
1. Enter the equation into Y_1 using the Y= screen. Press ZOOM 6:ZStandard to graph the function in the standard viewing window.

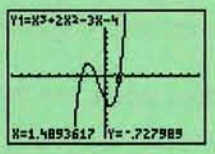




2. Press TRACE. Use the LEFT and RIGHT ARROW keys to move the cursor along the graph of the curve. Estimate the zeros of the function by moving the cursor as close to the x-intercepts as possible.







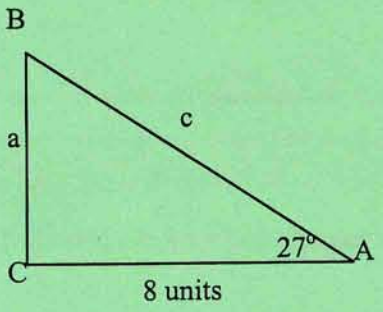
Using the TRACE feature, the zeros of this function can be estimated to be x = -2.6, -1.1, and 1.5.

Trigonometric Functions

The TI-83 is capable of calculating the sine, cosine, and tangent ratios. The inverse trigonometric functions can also be calculated. For this section, be sure that your calculator is in degree mode.

1. Press MODE. If necessary, use the DOWN ARROW to move to the Radian Degree line and highlight Degree by moving the cursor to Degree and pressing ENTER.

Example: Use trigonometric and inverse trigonometric functions to solve the right triangle.

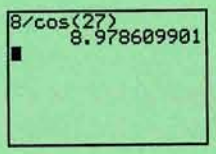


1. To determine the measure of side c, use the cosine ratio.

$$\cos 27^\circ = \frac{8}{c}$$

$$c = \frac{8}{\cos 27^\circ}$$

2. Press 8 ÷ COS 27 ENTER.



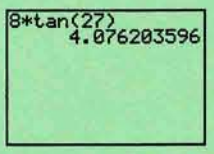
Note: The left parenthesis is automatically inserted on the TI-83.

3. To determine the length of side a, use the tangent ratio.

$$\tan 27^\circ = \frac{a}{8}$$

$$8 \tan 27^\circ = a$$

4. Press 8*tan 27 ENTER.



5. To determine the measure of angle B, use the inverse sine function.

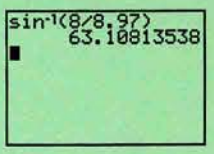
$$\sin B = \frac{8}{c}$$

$$\sin B = \frac{8}{8.97}$$

$$B = \sin^{-1}\frac{8}{8.97}$$

6. Press 2^{nd} SIN (SIN^{-1})(8 ÷ 8.97) ENTER.

NOTE: The ratio is entered in parenthesis.



Value

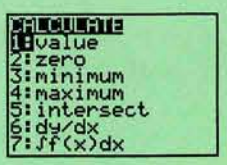
The value feature can be used to evaluate a function at a particular value of x. It works in conjunction with a graph of a function.

1. Enter an equation into Y_1.

Example: $Y_1 = 2x^2 + 3x + 1$

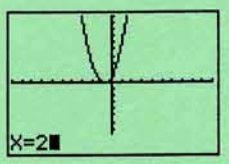
2. Press ZOOM 6: Zstandard to view the function in the standard viewing window.

3. To evaluate the function at different values of x, press 2^{nd} CALC and choose option 1: value.

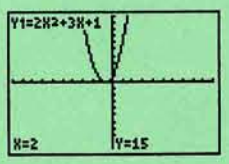


4. Enter a value for x for which you would like to find the value of the function.

Example: x=2



5. Press ENTER to see the value of the function at the selected value of x.

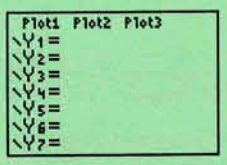


Note: You can do this many times in a row, but only for values of x in the Window Range.

Y=

The Y= menu is used to enter functions into the calculator that will be graphed.

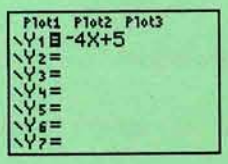
1. Press Y=.



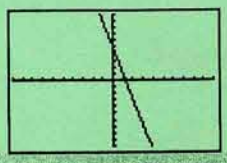
2. Up to 10 equations can be entered and graphed. Press the DOWN arrow to see Y_8-Y_0.

3. Type in the equation to be graphed.

Example: $Y_1 = -4x + 5$ (Note: Be sure to use the grey (-) key not the blue – key when typing the –4x part of the equation.)



4. Press GRAPH. Depending on the viewing window, you may or may not see the graph. To view the graph in the standard viewing window, press ZOOM 6: Standard. See the ZOOM section of the manual for more details.



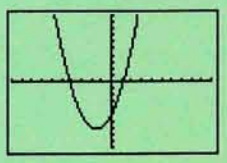
zero

The zero function calculates the x-intercepts of a function in the graphing screen.

1. Enter a function in the Y= menu.

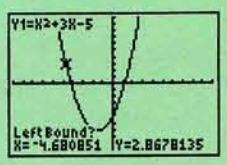
   For example: $Y_1 = x^2 + 3x - 5$

2. Press ZOOM 6: ZStandard to view the function in the standard viewing window.

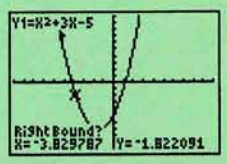


3. Press 2^{nd} TRACE (CALC) and select option 2: zero.

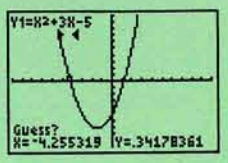
4. The zero function calculates one x-intercept at a time. After selecting option 2: zero, the calculator asks for the Left Bound. This is any value to the left of the x-intercept being calculated. Use the LEFT and RIGHT arrow keys to move the cursor somewhere to the left of the zero being calculated and press ENTER.

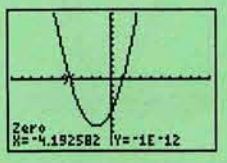


5. The calculator asks for the Right Bound. Use the LEFT and RIGHT arrow keys to move the cursor somewhere to the right of the zero being calculated and press ENTER.



6. The calculator asks for a guess as to where the x-intercept is located. Use the LEFT and RIGH arrow keys to move the cursor as close to the x-intercept as possible and press ENTER. The x-intercept should now be displayed. Notice the y-value. It should be zero or at least very close to zero!





Note: In this example the y-value is -1×10^{-12}, which is extremely, close to zero! To find the other zero, repeat steps 3-6 focusing on the x-intercept on the positive x-axis.

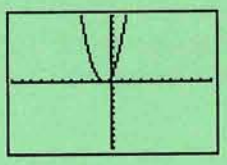
ZOOM/WINDOW

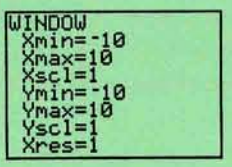
The ZOOM button changes the viewing window rapidly with pre-set ZOOM functions.

1. Enter an equation into the Y= screen.

   Example: $Y_1 = 2x^2 + 3x + 1$.

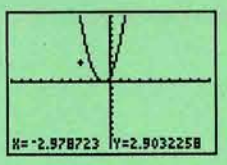
2. Press ZOOM 6: ZStandard. ZStandard creates the standard viewing window which goes from –10 to 10 on the x-axis and –10 to 10 on the y-axis. Press WINDOW to see this.





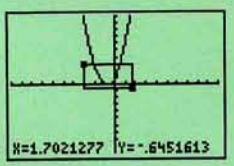
3. Press ZOOM 1: ZBox. ZBox allows zooming in on a particular region on the graph by boxing in the desired region. After pressing ZOOM 1, use the UP, DOWN, RIGHT, and/or LEFT arrow keys to move the cross hair around the screen. Think about where you would like one corner of the boxed region to be. When you have moved the cross hair to that spot, press ENTER.

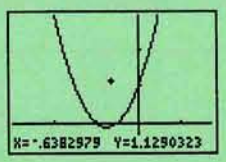
For Example:

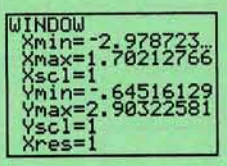


4. Use the UP, DOWN, RIGHT, and/or LEFT arrow keys to create a box around the region in which you wish to ZOOM. When the desired region is boxed in, press ENTER. When completed, press WINDOW to see how the viewing window has changed.

For Example:

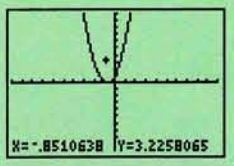


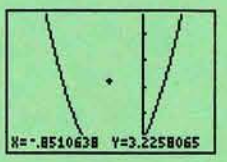


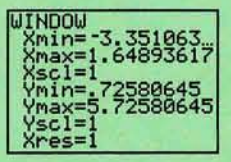


5. Press ZOOM 6: ZStandard to return the graph to the standard viewing window.

6. Press ZOOM 2: Zoom In. Zoom In will do just that, centered at a point that you select. After pressing ZOOM 2: Zoom In, use the UP, DOWN, RIGHT, and/or LEFT arrow keys to move the cross hair around the screen. Stop when the desired center of the Zoom In has been located. Press ENTER to cause the Zoom In to occur. When completed, press WINDOW to see how the viewing window has changed.

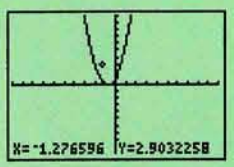
For Example: 

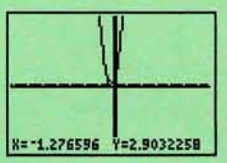


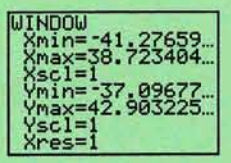


Note: The magnitude at which your calculator zooms may be different than this example.

7. Press ZOOM 6: ZStandard to return the graph to the standard viewing window.
8. Press ZOOM 3: Zoom Out. Zoom Out will do just that, centered at a point that you select. After pressing ZOOM 3: Zoom Out, use the UP, DOWN, RIGHT, and/or LEFT arrow keys to move the cross hair around the screen. Stop when the desired center of the Zoom Out has been located. Press ENTER to cause the Zoom Out to occur. When completed, press WINDOW to see how the viewing window has changed.

For Example: 





9. Press ZOOM 6: ZStandard to return the graph to the standard viewing window.

10. Press ZOOM 4: ZDecimal. ZDecimal will automatically create a viewing window which is considered "friendly". This means that when you TRACE on a graph viewed using Zdecimal, the values shown will be "friendly" decimals, showing accuracy to the nearest tenth rather than the long decimal values shown in other viewing windows. When completed, press WINDOW to see how the viewing window has changed.

For Example: