

Graphing Calculator Instructions TI-83, TI 83+, TI 84+

Introduction: In the instructions below, menu choices and keys are shown in capital letters. “Press” is used to indicate an actual key which should be pressed. “Select” is used to indicate a menu choice to be selected. Use the up/down arrow to select a different function. Use the right/left arrow to move along the graph (even though graph seems to go up/down if steep).

1. Graphing a function

Press $Y=$; enter your function using the $\boxed{X, T, \theta, n}$ key for the x variable. Then press GRAPH.

2. Zooming the graph window

Press ZOOM; select Zoom type from menu: (for starred choices, hit Enter a second time to see effect)

Zoom In--zooms in *

ZoomFit: Resizes window to see functions

Zoom out--zooms out *

ZTrig—Trigonometric zoom

ZStandard-calculator default (each axis is -10 to +10)

ZDecimal: When tracing, x moves by tenths.

ZSquare: Grid is square

ZInteger: When tracing, x moves by integers *

3. Selecting or deselecting a graph

Any function in the $y_1=$ window with a highlighted equal sign is a “selected function”. When you graph, all selected functions will be graphed in the graph window. To select or deselect a graph, go to the function list, put the cursor on the equal sign of the desired function, & press ENTER.

4. Tracing a curve

After the function is graphed, press TRACE, move the cursor right/left and read the $x=$ $y=$ coordinates at the bottom of the window.

5. Finding the y-intercept of a function

With the graph displayed, press CALC (2nd TRACE); this automatically selects 1: *value*, so just press ENTER; then enter 0 for the x value. Read the coordinates of the y -intercept at the bottom of the screen. **NOTE:** If more than one function is displayed, the y -intercept of the first function (which will be shown in the upper left of window) is shown. Use the Up/Down arrow keys to display the y -intercepts of the other functions.

6. Finding the x-intercepts of a function (roots)

With the graph displayed press CALC (2nd TRACE), select 2: *zero*. Position the cursor to the left of the x -intercept and press enter. Now position the cursor to the right of the x -intercept and press ENTER. Press ENTER again; read the coordinates of the intercept at the bottom of the screen. If you want to find other roots, repeat the process but select points to the left and right of another intercept.

7. Finding the Maximum or Minimum point of a function

With the graph displayed, press CALC (2nd TRACE), press 3: *minimum* or 4: *maximum*. Position the cursor to the left of the maximum (or *minimum*) and press enter. Now position the cursor to the right of the maximum (or minimum) and press ENTER. Press ENTER and read the coordinates at the bottom of the screen.

8. Finding the intersection of two curves

Press $Y=$. Enter the functions on the screen. Press CALC (2^{nd} TRACE), select 5: *intersect*; press ENTER twice until you see 'Guess'; move cursor (left/right arrow) along curve until close to intersection; press ENTER . Read the coordinates at the bottom of the screen. If there is more than one point of intersection, get the other point by repeating above, but move cursor closer to other intersection point for the 'Guess'.

9. Finding the slope of a curve at a given point

With the graph displayed press CALC (2^{nd} TRACE), select 6: *dy/dx*. Move the cursor to the point at which you want to find a slope then press ENTER . Read slope at bottom of screen.

10. Drawing a tangent line to a curve at a given point

With the graph displayed press DRAW (2^{nd} PRGM), select 5: *tangent*. Move the cursor to the point of tangency; press ENTER . The x coordinate of the point of tangency and the equation of the tangent will be displayed at the bottom of the window.

11. Changing the graphing range

Press WINDOW . Fill in the values you wish to use for maximum and minimum on x and y axes. $x\text{Sc}1$ and $y\text{Sc}1$ set the scale on x and y axis. Do not change xres. Press QUIT .

12. Finding f(x) for a given value of x

Press CALC (2^{nd} TRACE), select 1: *value* then enter an x value. The corresponding y (or function or $f(x)$) value will be displayed. If your x value is beyond the visible domain you must resize window to include it or you will get ERR:INVALID . (It is OK to have y value invisible.)

13. Displaying a table of values for a function; change settings of table.

Press TBLSET (2^{nd} Window). Enter a starting value next to $\text{TblStart}=\mathbf{}$ and an increment next to $\Delta\text{TBL}=\mathbf{}$. Press TABLE (2^{nd} GRAPH) to display the table. (E.g., Start at 100 and increment by 5 to see values of function for 100, 105, 110, 115, etc; or to see values around zero, start at 0 and increment by 0.1 or 0.01). Move beyond the visible table with the up/down arrows. **To display only values you ask for**, press TBLSET (2^{nd} Window), arrow to *Indpnt*: position cursor on *Ask*, press ENTER . Press TABLE (2^{nd} Graph). Enter a value. Press ENTER ; y value is in the table.

14. Solving systems of more than 2 linear equations or more than two unknowns. Use Matrix methods (#20). **Solving systems of two linear equations.** See #8 above.

15. Finding the roots of a non-linear equation

First graph the equations and note the approximate solution(s) (i.e. the x- intercepts). Now press MATH and select 0: *Solver*. Enter the equation next to $\text{eqn: } 0=\mathbf{}$. Next to $\text{X}=\mathbf{}$ (use arrow key) enter one of your approximations. Now press ALPHA , then press SOLVE (over the ENTER key) to read the solution. Enter any of the other approximations to get the other solutions.

16. Using a variable to store a number

On the home screen enter the number you wish to store (or press ANS if you want to store the answer to the previous calculation). Press $\text{STO}\rightarrow$. Press X key OR press ALPHA (to enter a letter), enter one letter for the variable name of 8 characters) ; press enter.

17. **Recalling a value stored in a variable**

To recall a stored value, press RCL (note: calculator automatically switches to alpha mode to accept a letter), enter the variable letter you wish to recall.

18. **Time-Value-Money (TVM), annuities and loans**

Press APPS. Select 1: TVM Solver and enter the known quantities in the table. Leave the unknown quantity blank or enter 0. Move the cursor to the unknown and press ALPHA, then press SOLVE (over the ENTER key).

The calculated value should appear for the unknown.

Variables used in TVM (Time-Value-Money) Solver

N= Total number of payment periods

I%= Annual interest rate (enter in as %; e.g. 5% is entered as “5”, NOT “.05”)

PV= Present value

PMT= Payment amount

FV= Future value

P/Y= Number of payment periods per year

C/Y= Number of compoundings per year

PMT: Select END for an ordinary annuity, BEGIN for an annuity due.

Note: For loans, the loan amount will be the present value (PV) of the annuity. Money that is paid out should be entered as negatives.

To exit, press 2nd QUIT.

19. **Effective yield**

To calculate effective yield of an investment press FINANCE(2nd x^{-1}) [83+ or 84: Press 2nd APPS], then arrow down to select C:→ EFF; enter nominal rate, a comma, and number of compoundings, then press ENTER. For example an investment paying 8% annually with weekly compounding would have an effective yield of: →EFF (8,52) which is equivalent to 8.23%

20. **Matrices**

Entering a matrix:

Press MATRX [83+ or 84: Press 2nd x^{-1}], select EDIT (by using right arrow key) then press ENTER.

Enter the dimensions (# of rows x # of columns) of the matrix, press ENTER. Use arrows to move around matrix, filling in the values in the table. Press 2nd QUIT.

Calculations with matrices:

To insert the matrix name into a calculation, press MATRX, and choose the matrix you want (A-J), press enter.

Matrix operations:

After the matrix has been entered, several matrix operations are available. Press MATRX, then select MATH on screen using the arrow keys, then select the desired operation from the menu using the arrow keys, then press enter. (For example: Operation “RREF” will reduce the matrix and solve a system of equations – see handout on RREF for solving system of equations.)

21. Statistics

Entering a list of numbers:

Press STAT and select EDIT (from the list), then press enter. Clear the list if necessary (move cursor to list name and hit CLEAR then ENTER; or MEM [2nd Plus-sign] 4). Enter your list of numbers in any column of the table **L1-L6** (enter value then use down arrow or ENTER). You may also enter your numbers in one list and the corresponding frequencies in another list.

Finding mean, variance, standard deviation (single variable):

After entering your list, return to Calculator mode (2nd MODE). Press STAT, select CALC (using arrow keys) from the menu, then select 1-Var Stats, press ENTER. Enter the list name (in yellow over 1-6), press ENTER. Read values by moving cursor down. (See handout.)

Finding area under the normal curve between two values:

If you know the mean and standard deviation of a population, you can approximate the percent of the population between a lower value and an upper value. Press 2nd VARS (DISTR) select normalcdf. Then enter the lower value, upper value, mean, standard deviation, separated by a comma. (Mean and Standard deviation are optional and 0,1 respectively by default.)

Linear regression (curve fitting):

After entering ordered pairs of data points into two lists (**L1-L6**) (see first topic above), press STAT, select CALC from the menu, then select 4:LinReg. Enter your x-list name, a comma, and then your y-list name. [If you want the regression equation to automatically get placed into Y1, enter a comma, press VARS key, arrow right to Y-Vars, hit ENTER, hit ENTER.] Press ENTER; read the slope (a) and y-intercept (b) of line of best fit. Note: If you choose Diagnostic ON from the CATALOG you will also get the coefficient of correlation (r) when you do LinReg. See handout on Linear Regression for more details.