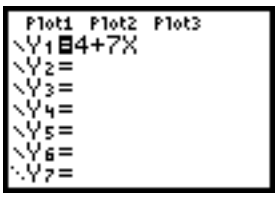
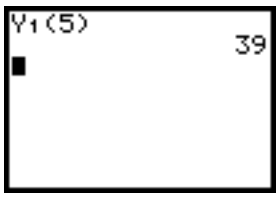
CHAPTER 4 Calculator Notes for the TI-83 and TI-83 Plus

Note 4A • Function Notation

The calculator treats an equation entered into the Y= screen as a function. A function can be evaluated for different *x*-values using standard function notation. For example, Y1(5) will give the value of the function when *x* is 5. On the Home screen press VARS **Y-VARS 1:Function…** followed by the number of the equation you want, and the *x*-value.





Note 4B • Movin' Around

With bits of tape, label two CBRs A and B. Label two calculators A and B, and connect each to the respective CBR. Use the RANGER program to collect data for 10 seconds. See **Note 3C** for help with the RANGER program.

For both calculators, the time data will be in list L1 and the distance data will be in list L2. On the Home screen of calculator B, enter L1→L3, press ENTER, enter L2→L4, and press ENTER. This moves calculator B's time and distance data to lists L3 and L4.

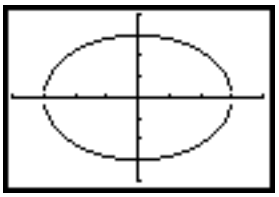
Finally, each group member should link to calculator A and copy lists L1 and L2, and link to calculator B and copy lists L3 and L4. See **Note 1J** for help with linking lists.

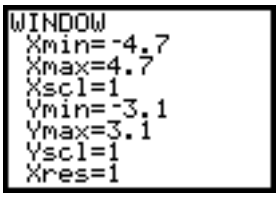
Note 4C • Friendly Windows

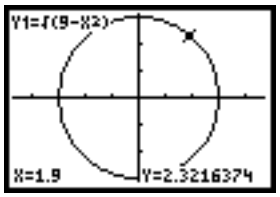
A friendly window scales the *x*-axis to correspond to the Graph screen's width in pixels (94). As a result, when you trace a curve on a friendly window, the spider always falls on points whose *x*-coordinates are "nice" decimal numbers. The *y*-coordinates are computed values and depend on the function being traced; they may or may not be nice decimal values.

If the *y*-axis is scaled so its units are the same as the units on the *x*-axis, then the window will be a "square" window. On a square window there is no distortion of the graph.

One friendly square window whose trace point has *x*-coordinates that are exact tenths can be found by pressing ZOOM **4:Decimal**.







[−4, 4, 1, −4, 4, 1]

This window is a little small for much of the work in this course. However, if you double the minimum and maximum values in the window screen, you can get a larger friendly square window that is often useful.

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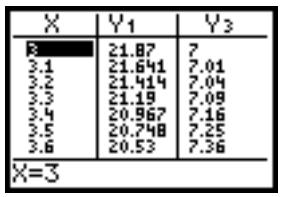
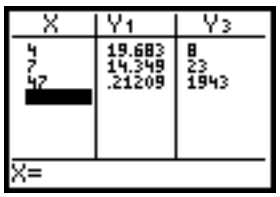
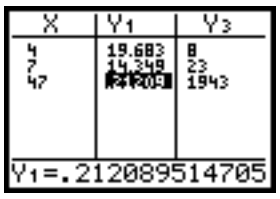
Press 2nd [TABLE] to display the table.

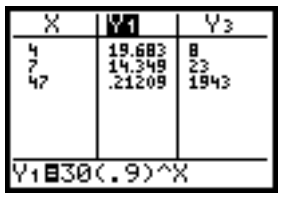


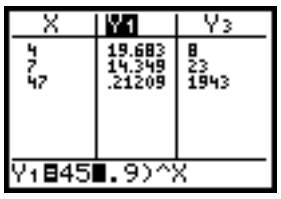


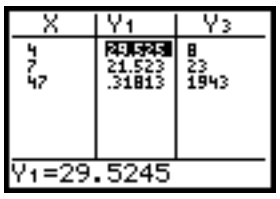
If **Indpnt:** is set to **Auto** on the TABLE SETUP screen, you can arrow up or down to see more *x*-values. You can also arrow right to see values of other functions that are turned on in the Y= screen. You can see only two columns of dependent variables at a time.

If you arrow up to the top of a function column, you can see the equation displayed at the bottom of the screen. Press ENTER to edit the equation. The changes will be reflected in the table when you press ENTER again.









Note 3C • Balloon Blastoff

With a link cable, connect the CBR to the calculator. Be sure to push in each plug firmly. The application will be in either the applications menu or the programs menu. Press APPS; if CBL/CBR is there, choose it and select 3:RANGER. If it isn't, press PRGM. In the submenu EXEC, arrow down to see if RANGER is one of the choices. If so, select it. Otherwise, you will need to load the program from the CBR. See **Note 1F** for help loading RANGER.

Press ENTER to see the MAIN MENU. Select 1:SETUP/SAMPLE. Set REALTIME: to No. Arrow down to TIME(S). Enter the number of seconds you want to follow the rocket (2 should be good), and press ENTER. Finally, set BEGIN ON: to [TRIGGER].

Now arrow up to START NOW and press ENTER. Press ENTER again for more instructions. Disconnect the CBR if you wish.

Aim the CBR at the rocket. Right before the motion begins, start collecting data by pressing the trigger on the front of the CBR. If you think you didn't collect good data, get ready to restart the motion, again press the trigger, and repeat the movement.

Reconnect the CBR to the calculator and press ENTER. A graph of the data will be displayed. You can now unplug the CBR again.

You can transmit the data to another calculator by connecting it to the CBR, starting the RANGER program, choosing 5:TOOLS from the MAIN MENU, and then selecting 1:GET CBR DATA.

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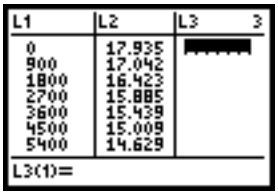
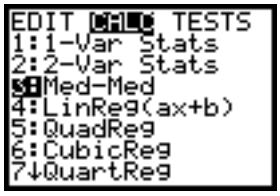
Clean-Up

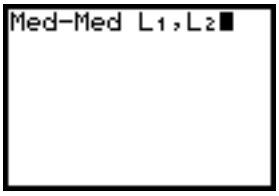
RANGER automatically sets your calculator to display three decimal places on the Mode screen. It also turns off expressions in the Format screen. Press MODE and reset the second line to **Float**, and then press 2nd [FORMAT] and select **ExprOn**.

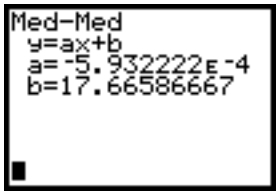
Note 3D • Median-Median Line

The calculator can find the equation of the median-median line for a set of data. Press STAT **CALC 3:Med-Med**, then enter the two lists that contain the data, separating them with a comma. The independent variable list should be first. The command's default is to use lists L1 and L2, but it is a good habit to always specify the lists to be used.

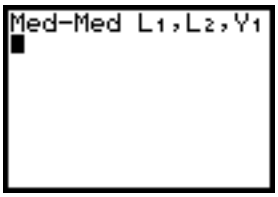


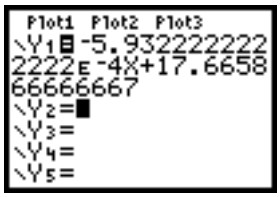


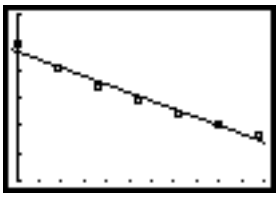




If you want the equation placed in Y1 on the Y= screen, after the second list press , VARS **Y-VARS 1:Function... 1:Y1** ENTER.







[0, 5500, 500, 13, 19, 1]

Note 3E • Residuals and the Root Mean Square Error

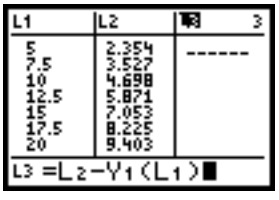
Once you have found a model for paired data, you can calculate the residuals and then the root mean square error.

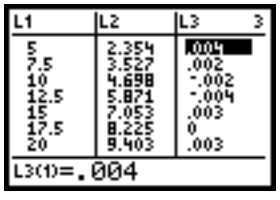
For this example, assume that your data are stored in lists L1 and L2 and your equation is stored in Y1.

Residuals

a. Press STAT ENTER.

b. Move to the name cell at the top of list L3. Define list L3 as the residuals by entering the expression L2–Y1(L1). To get Y1, press VARS **Y-VARS 1:Function 1:Y1**. The resulting list will not change if you change the data in list L1 or list L2 or the equation in Y1. If you want this list to be dynamic (changing when list L1, list L2, or Y1 changes), enter the expression within quotation marks using ALPHA ["].





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