Getting to know your TI-83

Press [ON] to begin using calculator.To stop, press [2nd] [ON] .

To darken the screen, press [2nd] [Δ] alternately. To lighten the screen, press [2nd] [∇] alternately. Press [2nd] [+] to reset or clear the memory of the calculator.

1. [ENTER] - equal
2. [2nd] - yellow keys
3. [Alpha] - green keys
4. [2nd] [Alpha] - alphabetic info
5. [X,T,θ,n] - prints X in function mode; prints T in parametric mode; prints θ in polar mode; prints n in sequence graphing mode
6. [^] - exponent key
7. [Alpha] [0] - space key
8. [2nd] [^] - π key
9. [(-)] - negative key
10. [2nd] [(-)] - stores last answer
11. [Math] [▷] 1 - absolute value
12. [DEL] - deletes character
13. [2nd] [DEL] for INS - inserts character
14. [MODE] - sets various modes of calculator - At present, your calculator should have the following settings highlighted: Norm, Float, Radian, Function, Connected, Sequential, Real, Full

15. [MATH] - 1. display answer as a fraction
    2. display answer as a decimal
    3. cube a number
    4. take the cube root of a number
    5. take the xth root of a number
    6. minimum of a function
    7. maximum of a function
    8. numerical derivative
    9. function integral
    10. solves for any variable in an equation

16. [2nd] [MATH] - (for TEST) -
    1. =
    2. ≠
    3. >
    4. ≥
    5. <
    6. ≤

17. [2nd] [MATRIX] - (for ANGLE) -
    1. degree notation
    2. minute notation
    3. radian notation
    4. displays as degree/minute/second
    5. - 8. used to change from rectangular coordinates to polar coordinates or from polar to rectangular

18. [PRGM] - EXEC EDIT NEW

19. [2nd] [PRGM] - (for DRAW) -
    1. Clr draw
    2. Line
    3. Horizontal
    4. Vertical
    5. Tangent
    6. Draw function
    7. Shade
    8. Draw inverse
    9. Draw circle
    10. adds text to graph
    A. free-form drawing tool

Graphing keys - top row of calculator

1. [Y=] - allows you to enter up to ten separate equations

2. [WINDOW] - sets dimensions of viewing rectangle

3. [ZOOM] - allows you to adjust the viewing rectangle

4. [TRACE] - allows you to find a specific point on a graph

5. [GRAPH] - draws the graph of a function

Using the viewing rectangle

The viewing rectangle on the TI-83 is 94 pixels (A pixel is a picture element.) by 62 pixels. It is useful when graphing to have a "friendly window" in order to avoid distortion in the graph and to avoid obtaining non-integer values when using the trace function of the TI-83. In fact, a program helps alleviate these problems.

A Friendly Window

```
Program:WINDOW
:ClrHome
:Disp "SCALE FACTOR ="
:Input F
:-4.7F→Xmin
:4.7F→Xmax
:F→Xscl
:-3.1F→Ymin
:3.1F→Ymax
:F→Yscl
:Stop
```

Save Graphing Window

```
Program:SAVWINDO
:Xmin→A
:Xmax→B
:Xscl→C
:Ymin→D
:Ymax→E
:Yscl→F
:Stop
```

Recall Graphing Window

Program:RECWINDO
:A→Xmin
:B→Xmax
:C→Xscl
:D→Ymin
:E→Ymax
:F→Yscl
:Stop

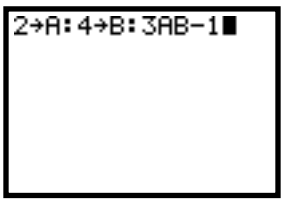
Basic Calculator Operations

1. Simplify: $\dfrac{37+4-3^3}{16-(1+2)^2}$

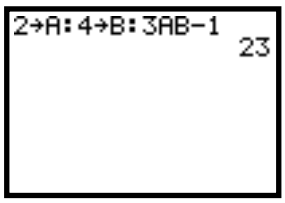
2. Simplify: $\sqrt{3^2+4^2}$

3. Let a = 2 and b = 4. Evaluate the expression: 3ab - 1

Screen displays:



ENTER



4. When you were collecting the data required for a water temperature project, you forgot to take temperature readings in degrees Celsius. The following formula is used to convert from degrees Fahrenheit to degrees Celsius:

$$C=\frac{5}{9}(F-32) \quad \text{or} \quad C=\frac{5(F-32)}{9}$$

a. Change 50°F to degrees Celsius.

b. Change 103°F to degrees Celsius.

5. Approximate the value of each expression to the nearest thousandth:

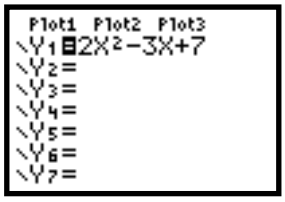
a. $\sqrt[3]{15}$

b. $\sqrt[5]{46}$

6. Evaluate the function, $f(x) = 2x^2 - 3x + 7$ for $x = 2$, $x = -1$, $x = 0$, and $x = 141.3456$.

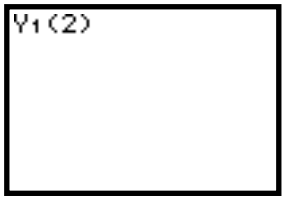
Store $f(x) = 2x^2 - 3x + 7$ in [Y=] .

Press [Y=] and type the function in Y_1. (You can choose any Y you wish.)

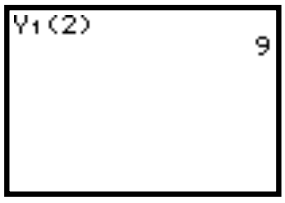


Press [2nd] [QUIT]. Press [VARS] [▷] [ENTER] [ENTER] .

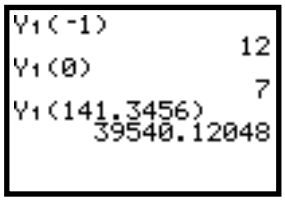
Press [( ] 2 [ )] .



Press [ENTER] .



Follow the same procedure in order to evaluate f(x) for each value of x.



Calculator Activity 1

PLOTTING POINTS FROM DATA

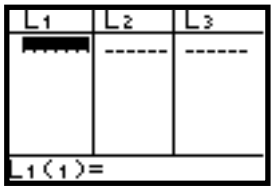
Entering Data into Columns

The data in the chart below is water temperature measured at the same site over a period of weeks. L_1 contains the number of the week and L_2 contains the temperature in degrees Celsius recorded for the week. These lists must have the same number of data points.

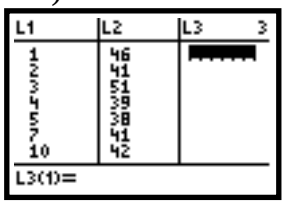
L_1	L_2
1	46
2	41
3	51
4	39
5	38
7	41
10	42
12	47
13	37
15	39
16	41

Press
Error!.

Press [1] (to select Edit) .



Enter the X values in L_1. Press [ENTER] after each entry to go to the next line. When finished with the X values, press [▷] to place the cursor at the beginning of L_2. Enter all Y values in L_2. (The screen below does not display the entire data set.)

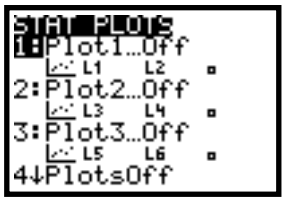


Press [2nd] [QUIT].

Plotting Data Points

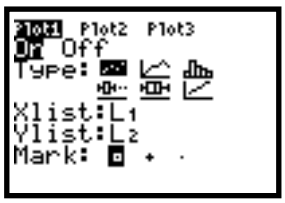
To graph the data points in the lists, L_1 and L_2:

Press [2nd] [STAT PLOT].

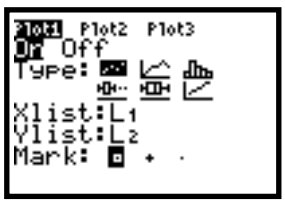


Press [ENTER] .

Press [ENTER] . (The cursor is blinking on the On. By pressing enter, you are turning on stat plot 1.)



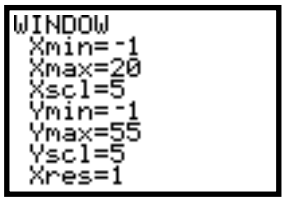
Use the down arrow to move to the Type line. If necessary, use the left arrow to move to the scatter plot icon.



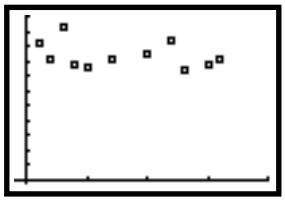
Use the down arrow to move to Xlist.
Press [2nd] 1.

Use the down arrow to move to Ylist.
Press [2nd] 2.

Press [2nd] [QUIT]. Press [WINDOW] and choose appropriate settings for the data.

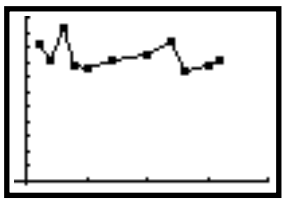


Press [GRAPH] . The scatter plot at the right is only one way to represent the data graphically.



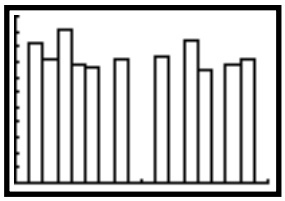
Press [2nd] [STAT PLOT]. Choose line graph. Press [2nd] [QUIT].

Press [GRAPH] . A line graph is another way to represent data graphically.



Press [2nd] [STAT PLOT]. Choose a bar graph or histogram. L_1 is in Xlist. Press [2nd] 2 to put L_2 in Freq. Press [2nd] [QUIT].

Press [GRAPH] . Note: WINDOW settings are 0,18,1,0,55,5,1.



Temperature by week

Before you go to another activity, turn "Off" all stat plots.

Calculator Activity 2

GRAPHING WITH TI-83

Graphing an Equation with TI-83

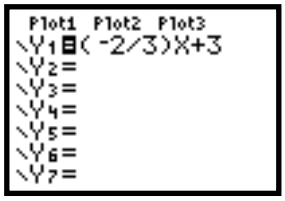
1. Solve the equation for *y*.
2. Enter the equation in [Y=] .
3. Determine an appropriate viewing rectangle. Enter the values in [WINDOW] .
4. Press [GRAPH] .

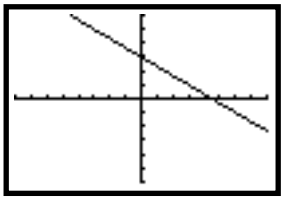
Example 1: Graph 2x + 3y = 9. An appropriate [WINDOW] is –9, 9, 1, –6, 6, 1, 1.

Answer: Solve 2x + 3y = 9 for y.

Store $y = -\frac{2}{3}x + 3$ in Y_1.

Press [GRAPH] .

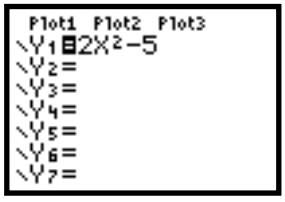


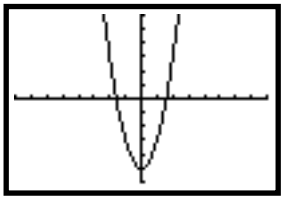


Example 2: Graph $y = 2x^2 - 5$.

Answer: Store $y = 2x^2 - 5$ in Y_1.

Press [GRAPH] .

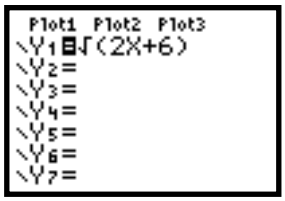


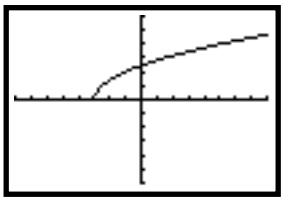


Example 3: Graph $y = \sqrt{2x + 6}$.

Answer: Store $y = \sqrt{2x + 6}$ in Y_1.

Press [GRAPH] .

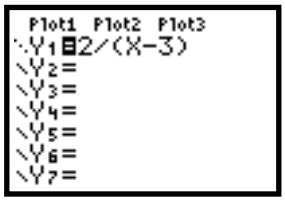


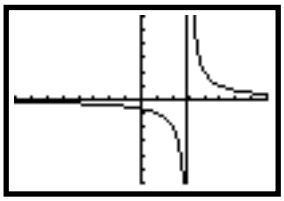


Example 4: Graph $y = \frac{2}{x-3}$. Since this equation represents a rational function, we know that we have to eliminate any value that makes the denominator equal to 0. This function has a vertical asymptote at x = 3.

Answer: Store $y = \frac{2}{x-3}$ in Y_1.

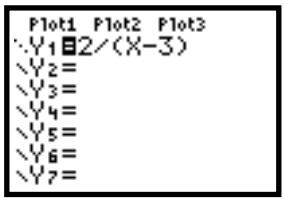
Press GRAPH.



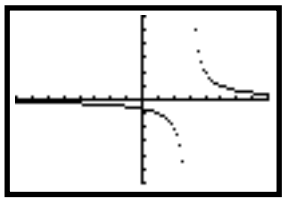


Notice that the graph should consist of two unconnected portions - one to the left of x = 3 and the other to the right of x = 3. To eliminate the problem with the graph, change the mode of the calculator from connected to dot. There are two ways in which to make this change.

Press Y=. Arrow to the left as far as possible. Press ENTER repeatedly to rotate through the graph styles. Stop on ⚐

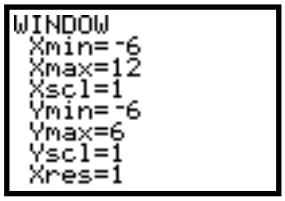


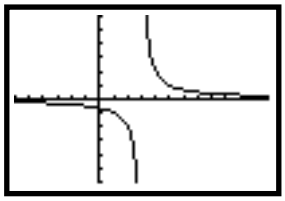
Press GRAPH.



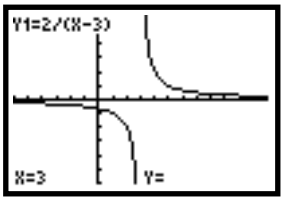
This graph is more difficult to read because it uses a collection of dots rather than a smooth curve.

If you choose window settings in which the vertical asymptote is the center of the x-values, you will be able to use connected mode and to obtain an accurate graph. In this example, x = 3 is the vertical asymptote. Change the window settings so that x = 3 is exactly the middle value between Xmin and Xmax.





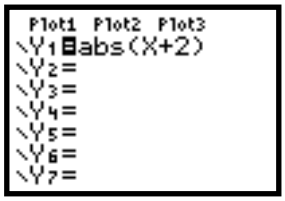
Using the trace cursor shows that the function is undefined when x = 3.

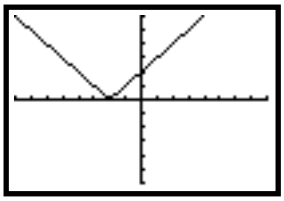


Example 5: Graph $y = |x+2|$.

Answer: Store $y = |x+2|$ in Y_1.

Press [GRAPH] .

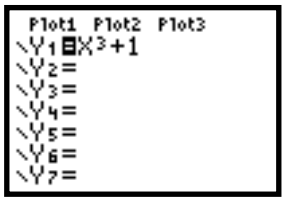


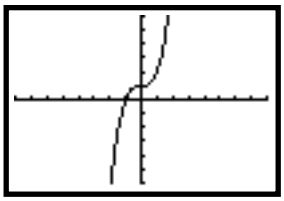


Example 6: Graph $y = x^3 + 1$

Answer: Store $y = x^3 + 1$ in Y_1.

Press [GRAPH] .

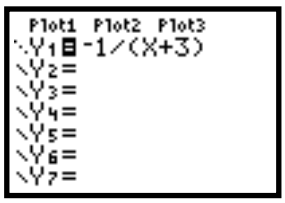


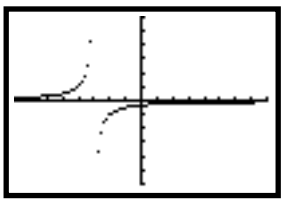


Example 7: Graph $y = -\frac{1}{x+3}$.

Answer: Store $y = -\frac{1}{x+3}$ in Y_1.

Press [GRAPH] .



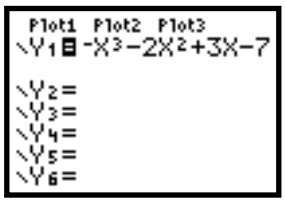


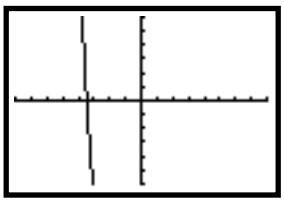
In all of the previous examples, the [WINDOW] settings remained the same. The ratio of x to y should be 3 to 2 in order to obtain a graph with little distortion. You will have to choose an appropriate [WINDOW] .

Example 8: Graph $y = -x^3 - 2x^2 + 3x - 7$

Answer: Store $y = -x^3 - 2x^2 + 3x - 7$ in Y_1.

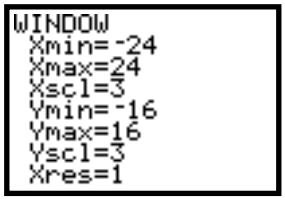
Press [GRAPH] .

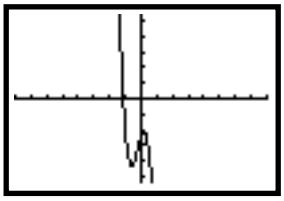




Is this the correct graph?

Choose a more appropriate [WINDOW] .





You may have to experiment to determine the most appropriate window settings. You could run program: WINDOW and change the scale factor until you have a correct graph.

The TI-83 has a table of values that may be used to list specific values for the independent variable, x, and the computed values of the dependent variable, y. For example, complete a table of values for the function y = –3x + 5 where x begins at –10 and is incremented by 1 unit.

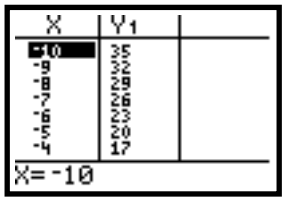
Press [2nd] [TBLSET].

This screen indicates that the table will start at 0 and have an increment of 1. Both variables will appear automatically.

Change table start to –10 and leave •Tbl = 1.

Enter y = –3x + 5 in [Y=] .

Press [2nd] [GRAPH].



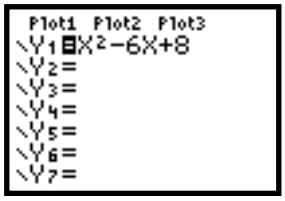
Use the arrow keys to scroll down the x- and y-values. You can also scroll up the x list and the y list.

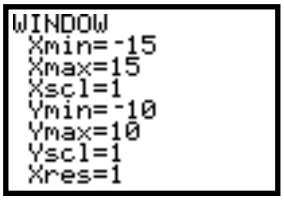
Intercepts

The table of values may be used to find the x-intercept(s) and y-intercept of a curve. Alternately, CALC 1 (for value) may be used to find the value of the y-intercept and CALC 2 (for zero) may be used to find the value of the x-intercepts, if they exist.

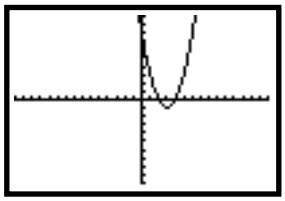
Store $y = x^2 – 6x + 8$ in Y_1.

Choose an appropriate [WINDOW] .

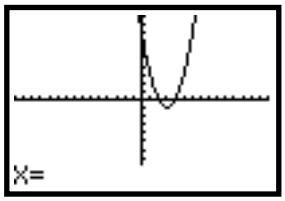




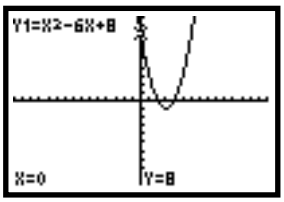
Press GRAPH .



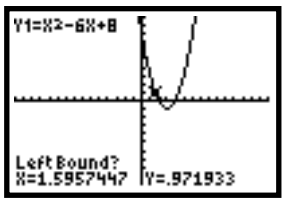
Press 2nd [CALC] 1.



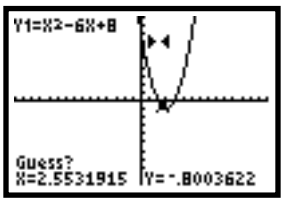
Enter 0 for X.



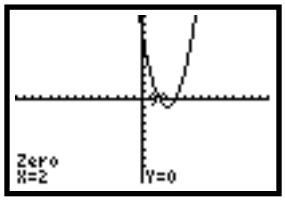
The point (0,8) is the y-intercept. To find the x-intercepts, press 2nd [CALC] 2. Select a left bound by pressing ENTER to the left of an x-intercept.



Use right arrow to move the cursor to the right of the x-intercept. Press ENTER .



Place the cursor on the x-intercept and press ENTER .



One of the x-intercepts is (2,0). Follow the above procedure to determine the other x-intercept which is (4,0).

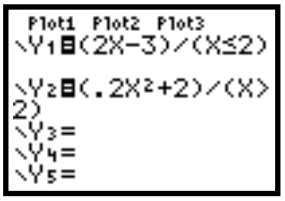
Calculator Activity 3

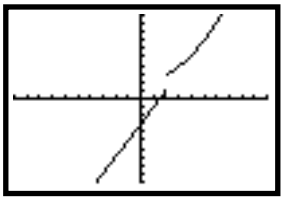
PIECEWISE-DEFINED FUNCTIONS

Graphing piecewise-defined functions

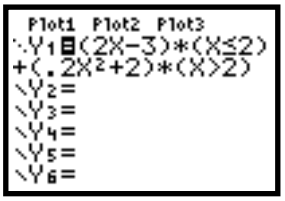
A function defined by two or more equations over a specified domain is called a piecewise-defined function. Graph $f(x) = \begin{cases} 2x - 3 & \text{if } x \le 2 \\ 0.2x^2 + 2 & \text{if } x > 2 \end{cases}$

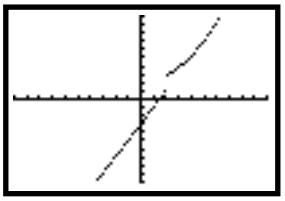
The screen shows a way to enter f(x) into the calculator.





The screen shows another way to enter f(x) into the calculator.



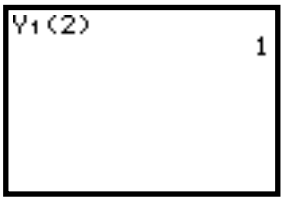


Evaluating a Function

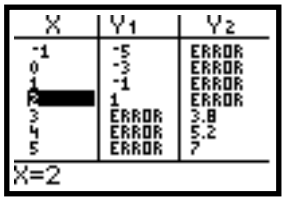
To evaluate a piecewise-defined function for a specific value of x, enter the following into the calculator.

Press [VARS] ~ [ENTER] [ENTER]

Press [(] 2 [)] [ENTER]



The table can also be used to evaluate a function.

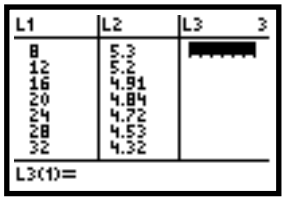


Linear Regression with TI-83

The winning times (in minutes) in the women's 400-meter freestyle swimming event in the Olympics from 1948 to 1992 are given by the following ordered pairs.

(1948, 5.30) (1952, 5.20) (1956, 4.91) (1960, 4.84) (1964, 4.72) (1968, 4.53)
(1972, 4.32) (1976, 4.16) (1980, 4.15) (1984, 4.12) (1988, 4.06) (1992, 4.12)

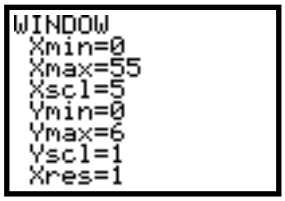
Enter the data in your calculator. If necessary, clear L_1 and L_2. (Highlight L_1, press [CLEAR] and [ENTER]. Repeat for L_2.) Let t = 0 represent 1940.



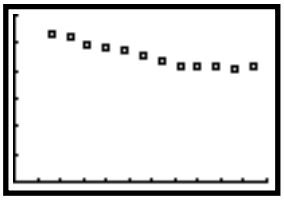
All of the data will not show on the screen.

Press [2nd] [QUIT].

Choose an appropriate window for the data.

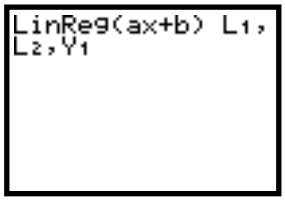


Press [GRAPH].

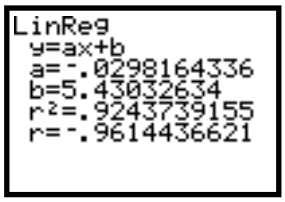


Press [2nd] [QUIT].

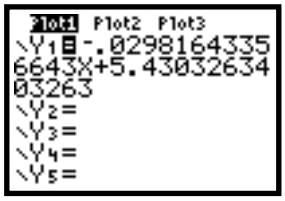
Press [STAT] ~ 4 (for LinReg(ax+b)). Press [2nd] [L_1] ¢ [2nd] [L_2] ¢ [VARS] ~ [ENTER] [ENTER].



Press [ENTER].



Press [Y=].



Press [GRAPH].