MATH 105
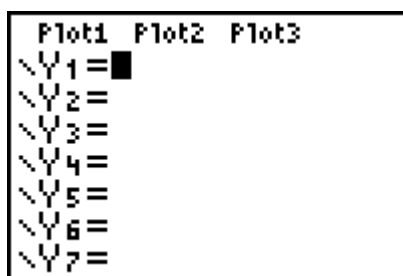# TI-83 Plus Graphing Calculator Tasks

I. Graphing Functions

Enter the function into the calculator.
Press Y=.

Type in the function and press ENTER. For the independent variable, use x, which is entered using the X,T,Θ,n key.

Graph the function.
To graph and make sure your graphing screen displays the "standard window," in which x and y both range from –10 to 10, press ZOOM and choose option 6: ZStandard. If you just press GRAPH, the function will appear in the last window the calculator used.

If you do not see the graph, or you only see part of it, press WINDOW and choose a different window size.

II. Special Functions

Absolute Value function, |x|.
Press Y=, then MATH. Press ▶ to highlight the NUM menu and choose option 1: abs(. This pastes abs(into the screen and you can type in what goes in between the absolute value bars. Don't forget to close the parentheses.

Greatest Integer function (step function)
Press Y=, then MATH. Press ▶ to highlight the NUM menu and choose option 5: int(. This pastes int(into the screen and you can type in the rest of the variables. Don't forget to close the parentheses.
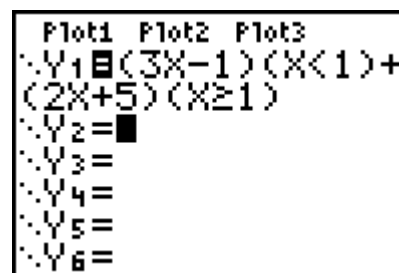
Piecewise Defined functions.
This is best explained by an example. To enter
$y = \begin{array}{l} 3x-1, x < 1 \\ 2x+5, x \geq 1 \end{array}$, do the following.

Press Y=, then (3 X,T,Θ,n – 1) (X,T,Θ,n 2nd [TEST] choose option 5: < 1) + (2 X,T,Θ,n + 5) (X,T,Θ,n 2nd [TEST] choose option 4: ù 1) ENTER.
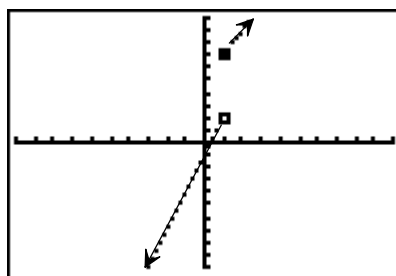Press GRAPH.

You must keep in mind the piece connecting the two pieces of the graph is not really part of the graph. It is a feature of the calculator that it tries to connect the dots, even when it is not supposed to.

This piece is not part of the graph
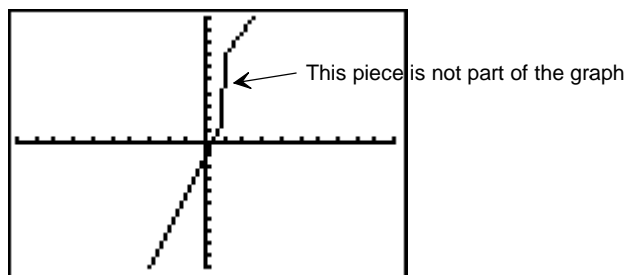
The **real** graph would look like this.

III. Evaluating Functions

If you have a function $f(x)$ and wish to evaluate the function for certain values of x, you can enter the function into your calculator and have it evaluate for you.

Press $\boxed{Y=}$. Type in the function and press $\boxed{ENTER}$. For the independent variable, use X, which is entered using the $\boxed{X,T,\Theta,n}$ key. Assume you entered the function into Y_1. There are two ways to evaluate the function.

Method 1: Press $\boxed{VARS}$ then $\boxed{\blacktriangleright}$ to highlight Y-VARS, and choose option 1: Function. Then choose option 1: Y_1. This pastes Y_1 into the home screen. Then type in (then the X value you want and then). Press $\boxed{ENTER}$.

Method 2: Graph the function, press $\boxed{2nd}$ [CALC] and choose option 1: value. At the bottom of the graph you will see X =. Type in the number and press $\boxed{ENTER}$.

If you wish to evaluate the function at many different values, you can use a TABLE.

Enter the function into Y_1. Press $\boxed{2nd}$ [TBLSET].
Use the arrow keys to change the settings. Tbl Start is the first value for X that you wish to display; ¾Tbl is the increment for X (so if Tbl Start is 0 and ¾Tbl = 0.5 the X values will be 0, .5, 1, 1.5, etc.); if you choose Auto, the table will be generated automatically; if you choose Ask, the calculator will ask you to type in the X value.

```
TABLE SETUP
 TblStart=0
 ΔTbl=1
Indpnt: Auto  Ask
Depend: Auto  Ask
```

Once you are done setting up the table, press [2nd] [TABLE].

X	Y₁	
0	1	
1	0	
2	1	
3	4	
4	9	
5	16	
6	25	

X=0

IV. Plotting Points and Finding Regression Curves

1. Check to see if you have any data in your lists.
Press the [STAT] key, then choose option 1: Edit.
If there is data in your lists, you must clear that list (see step 2). If not begin entering your data (see step 3).

2. Clear your lists, if necessary.
Press the [STAT] key, then choose option 4: ClrList. When ClrList appears on the screen, press the [2nd] key, then the [L1] key. Press [ENTER]. If you have more than one list to clear, when ClrList appears on the screen, press the [2nd] key, then the [L1] key, then the comma key, then the [2nd] key, then the [L2] key, etc. Press [ENTER].

3. Enter your data.
Press the [STAT] key, then choose option 1: Edit. Enter your data by typing in the numbers and using the arrow keys.

L1	L2	L3	3
9000	9110		
10000	10000		
11000	10850		
12000	11600		
13000	12240		
14000	12830		
15000	13360		

L3(1)=

4. Make a scatterplot of your data.
Press [2nd], then [STAT PLOT]. All the Plots should be turned off.
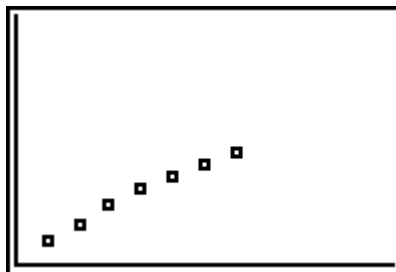
STAT PLOTS
1:Plot1...Off
   ⌐ L1   L2   ▫
2:Plot2...Off
   ⌐ L1   L2   ▫
3:Plot3...Off
   ⌐ L1   L2   ▫
4↓PlotsOff

Turn Plot1 On: Choose option 1: Plot1. Use the arrow keys to highlight the word On and make sure the screen looks like this:

Plot1 Plot2 Plot3
On Off
Type: ▦ ⌐ ⊞
      ⊞ ⊞ ⌐
Xlist:L₁
Ylist:L₂
Mark: ▫ + ·

Press $\boxed{\text{ZOOM}}$ and choose option 9: ZoomStat.

**This needs to be done one time only.**
Press $\boxed{\text{2nd}}$ [CATALOG] and use the down arrow key to move down until DiagnosticOn is selected. Press $\boxed{\text{ENTER}}$. This pastes DiagnosticOn into the home screen. Press $\boxed{\text{ENTER}}$ again to execute the command. You will see the response Done. This turns on the correlation coefficients.

5. Find the correlation coefficient and the regression line.
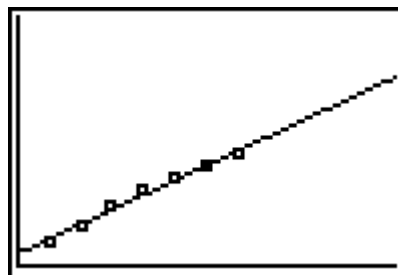Press $\boxed{\text{STAT}}$, then use the arrow key to move to CALC.

Choose option 4: LinReg(ax+b).
LinReg(ax+b) appears on the main screen. Press
$\boxed{\text{ENTER}}$.
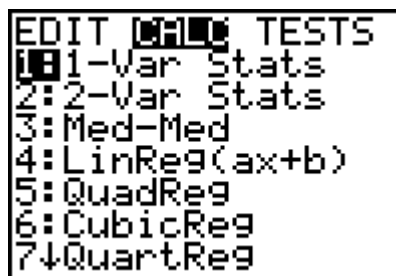
6. For future use, the regression line can be saved as a function.
Press $\boxed{\text{Y=}}$, then $\boxed{\text{VARS}}$, then option 5: Statistics, then use the arrow key to move over to EQ. Now choose option 1: RegEQ. The regression equation is entered in as a Y value.

7. Plot the regression line through the points.
Press the $\boxed{\text{GRAPH}}$ button.

8. Return your calculator back to normal graph mode.
Turn off all Plots (see Step 4, but turn plots Off instead of On). Return to the standard window by pressing $\boxed{\text{ZOOM}}$, then choosing option 6: ZStandard.

9. Predict some values using the regression line.
Make sure the values you want to plug in for x are between the highest and lowest x values of your data (do not extrapolate).
Press $\boxed{\text{VARS}}$, use the arrow key to move over to Y-VARS, choose option 1: Function, then choose the Y value for which you entered the regression equation. Press the (key, the x value you want, and then the) key. Press $\boxed{\text{ENTER}}$.

V. Solving Equations/Finding Zeros of Functions

If you have an equation, rewrite it in the form $f(x) = 0$. Press $\boxed{Y=}$. Type in the function $f(x)$ and press $\boxed{ENTER}$. For the independent variable, use X, which is entered using the $\boxed{X,T,\Theta,n}$ key. Graph the function, press $\boxed{2nd}$ [CALC] and choose option 2: zero.

The calculator will ask you to move the cursor to the left of where the zero is. Use the left and right arrow keys to move to the left of where your zero is on the graph (the x intercept). Press $\boxed{ENTER}$.
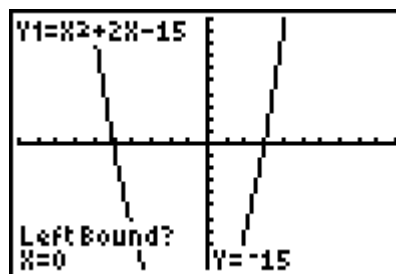
You are now asked to move the cursor to the right of where the zero is. Use the right arrow key to move to the right of where your zero is on the graph (the x intercept). Press $\boxed{ENTER}$.
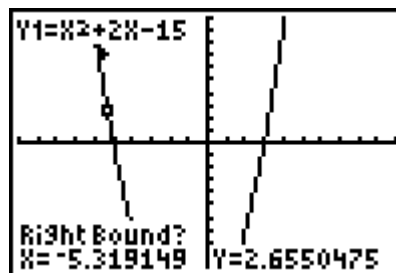
You are now asked to move the cursor close to where the zero is. Use the left arrow key to move close to where your zero is on the graph (the x intercept). Press $\boxed{ENTER}$. You will now get a decimal approximation of your answer.
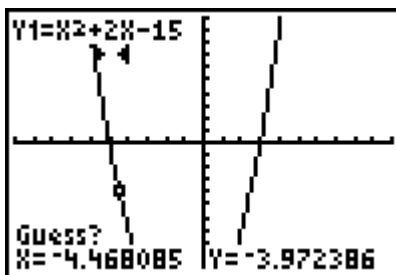
In all of these, instead of using the arrow keys to get to the left and right of the intercept, you can save time by simply typing in a number. For example, when you are asked for a left bound in the above example, just press the $\boxed{(-)}$ and 6 keys and then $\boxed{ENTER}$, since -6 is to the left of the one intercept we are looking for.

Important note on solving equations!

Occasionally you may get an answer such as -1.49999995. You can be reasonably certain the answer is -1.5. Also, keep in mind that a calculator answer of 2.3333333 is really $2\frac{1}{3}$ or $\frac{8}{3}$. If you get a decimal answer for which you do not recognize the rational number equivalent, make sure your instructor allows an approximate answer for the problem. If not, you will need to find the exact answer using algebra. Also, make sure you look at the graph in a larger and/or smaller window. Doing this will ensure that you see all of the zeros. You will need to find them all.

VI. Finding Points of Intersection of Curves

If you want to find where the graphs of $f(x)$ and $g(x)$ meet, one option is to find the zeros of the function $f(x) - g(x)$.

Alternately you can enter f and g into your calculator and graph them. Make sure the point of intersection is in the viewing window and then press [2nd] [CALC] and choose option 5: intersect.

You will be asked which curve you want to use as the first curve (this is just in case you have more than two functions graphed). If you only have two curves graphed, press [ENTER] to accept the default first curve.
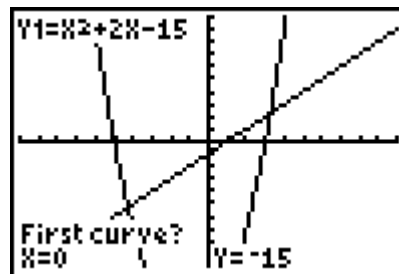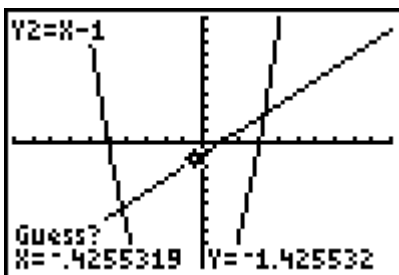
Next you will be asked which curve you want to use as the second curve (this is just in case you have more than two functions graphed). If you only have two curves graphed, press [ENTER] to accept the default second curve.
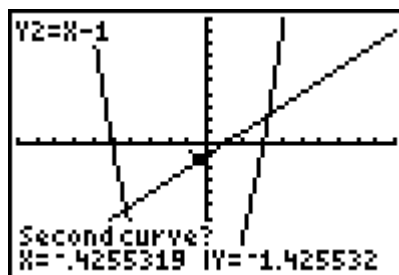
Next you are asked to move the cursor near the point of intersection. Use the arrow keys to do so and press [ENTER]. You answer will appear.

The comments in the **Important note on solving equations** also apply here!

VI. Finding Maxima and Minima

This also relates to finding where a function is increasing and where it is decreasing, because the locations of the maxima/minima are the places where the function changes from increasing to decreasing or vice versa. In addition, this relates to finding the range of a function.

If you have a function $f(x)$, press [Y=]. Type in the function $f(x)$ and press [ENTER]. For the independent variable, use x, which is entered using the [X,T,Θ,n] key. Graph the function, make sure the maximum/minimum you wish to find is in the viewing window and press [2nd] [CALC] and choose option 3: minimum or 4: maximum.
From here, this works just like section V on finding zeros. You are asked to first get to the left of the maximum/minimum, then to the right, and then to get close. The comments in the **Important note on solving equations** also apply here!