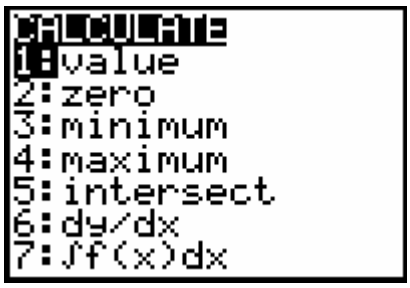
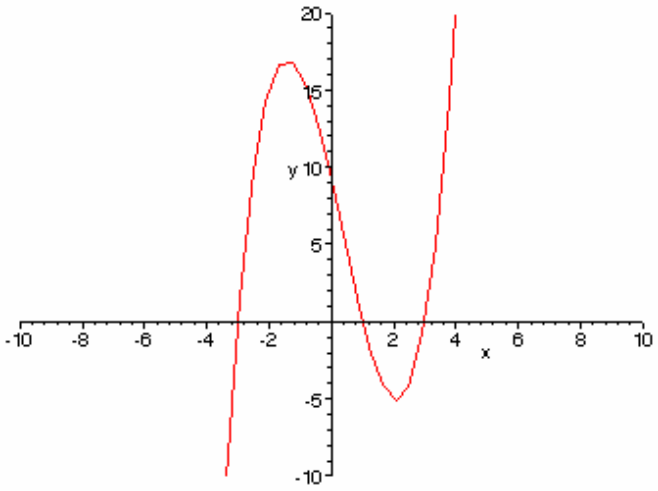
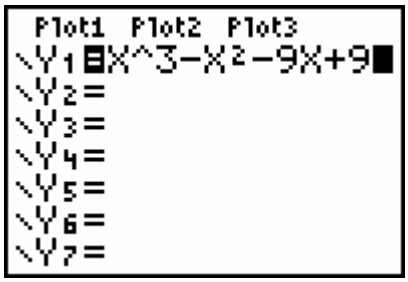
THE CALC MENU





Note: For the following procedures, these functions will be used as examples: Let $f(x) = x^3 - x^2 - 9x + 9$ and let $g(x) = x+14$.



Graph this function by entering it into $Y_1 =$:

(1) Press **Y=**

(2) Type the *f(x)*, the desired fuction: $x^3 - x^2 - 9x + 9$ next to $Y_1 =$.

To graph this function in a standard window:

(1) Press **ZOOM**

(2) Arrow down to the #6 option: *ZStandard*.

Note: We cannot see the relative maximum, so we need to increase the *Ymax* value. To do this, press **WINDOW**, and then change *Ymax* to 20. Press **GRAPH**. Now we can see both the relative minimum and the relative maximum. (See graph above.)

To find the relative minimum:

(1) Press **2nd**

(2) Press **TRACE**: (*Calc*)

(3) Arrow down to the #3 option: *Minimum*. Press **ENTER**.

(4) It will ask for a *Left Bound*. Move the flashing cursor to the *left* of the relative minimum Press **ENTER**.

(5) It will then ask for a *Right Bound*. Move the flashing cursor to the *right* of the relative minimum. Press **ENTER**.

(6) It will ask for a *Guess*. Move the flashing cursor *near* the relative minimum. Press **ENTER**

Note: These values are at the bottom of the screen: $x = 2.097166$, $y = -5.049042$ They are the coordinates of the relative minimum. Therefore, the relative minimum is (2.097, -5.049).

To find the relative maximum:

(1) Press **2nd**

(2) Press **TRACE**: (*Calc*)

(3) Arrow down to the #4 option: *Maximum*. Press **ENTER**.

(4) It will ask for a *Left Bound*. Move the flashing cursor to the *left* of the relative minimum. Press **ENTER**.

(5) It will then ask for a *Right Bound*. Move the flashing cursor to the *right* of the relative minimum. Press **ENTER**.

(6) It will ask for a *Guess*. Move the flashing cursor *near* the relative minimum. Press ENTER.

Note: These values are at the bottom of the screen: $x = -1.430499$, $y = 16.900894$ They are the coordinates of the relative maximum. Therefore, the relative maximum is (-1.43, 16.9).

To find the zeros of the function. (Zeros are the x-intercepts.)

(1) Press **2nd**

(2) Press **TRACE**: (*Calc*)

(3) Arrow down to the #2 option: *Zero* (*root*)

(4) It will ask for a *Left Bound*. Move the flashing cursor to the **left**, near the zero. Press **ENTER**.

(5) It will then ask for a *Right Bound*. Move the flashing cursor to the **right,** near the zero. Press **ENTER**.

(6) It will ask for a *Guess*. Move the flashing cursor **near** the zero. Press **ENTER**.

Note: You will need to repeat these steps for each zero. In this case, there are three zeros, so repeat three times. These values are at the bottom of the screen $x = -3$ $y = 0$, $x = 1$ $y = 0$, $x = 3$ $y = 0$. They are the coordinates of the zero. The zeros are (-3,0), (1,0) and (3,0).

To evaluate f(4).

(1) Press **2nd**

(2) Press **TRACE**: (*Calc)*

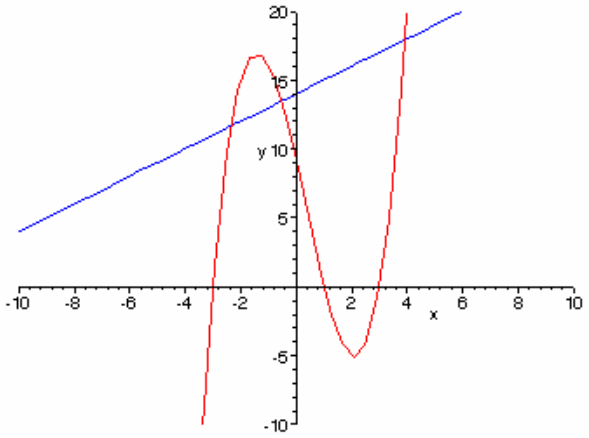
(3) Arrow down to the #1 option: *Value.*

(4) In the lower left hand corner of the screen, there will be X=. Key in a number. For example, press **ENTER**.

(5) These values are at the bottom of the screen. $x = 4$ $y = 21$ So, f(4) = 21.

To find the point(s) of intersection for two functions such as f(x) = $x^3 - x^2 - 9x + 9$ **and g(x) =** $x + 14$.

Note: The first function is already entered into $Y_1 =$. Enter the second function **g(x)** into $Y_2 =$ and Graph. Notice that we can see all three points of intersection. (See graph to the right.)



(1) Press **2nd**

(2) Press **TRACE**: (*Calc*)

(3) It will ask for a First Curve. Move the flashing cursor onto one of the two lines. Press **ENTER**.

(4) It will then ask for a Second Curve. Move the flashing cursor onto the other line. Press **ENTER**.

(5) It will ask for a Guess. Move the flashing cursor **near** the point of intersection. Press **ENTER**

Note: You will need to repeat these steps for each point of intersection. In this case, there are three points of intersection, so repeat three times.

These values are at the bottom of the screen. They are the coordinates of the zero.

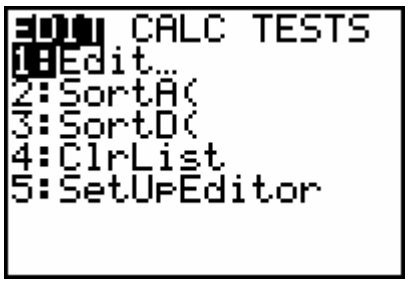
$x = -2.349967$ $y = 11.650033$

$x = -.5461107$ $y = 13.453889$

$x = 3.8960774$ $y = 17.896077$

The points of intersection are (-2.35, 11.65), (-.546, 13.454) and (3.896, 17.896).

THE STAT MENU

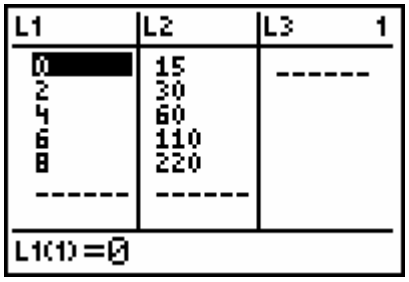


Note: For all of the following procedures, this table will be used with all of the examples:

x	0	2	4	6	8
y	15	30	60	110	220

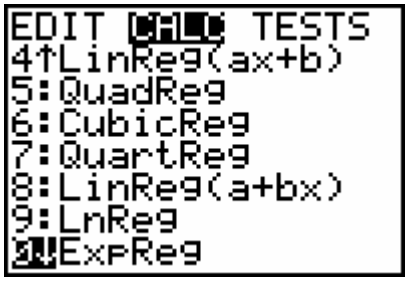
To Enter Data into L1, L2

(1) Press **STAT**
(2) Arrow down to #1 option: *EDIT*
(3) Press **ENTER**
(4) Enter x-values in L1
(5) Enter y-values in L2

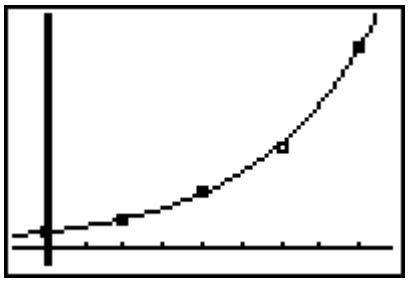


To Find a Regression Line or Best-Fit Line

(1) Press **STAT**
(2) Arrow to the right to *CALC*
(3) Arrow down to the regression equation you need to compute:
Option # 4: *LinReg* ~ Linear Regression
Option # 5: *QuadReg* ~ Quadratic Regression
Option # 6: *CubicReg* ~ Cubic Regression
Option # 0: *ExpReg* ~ Exponential Regression
Note: To follow along with the example, the Exponential Regression equation is the best-fit, so choose options # 0.
(4) Press **ENTER** twice.



Note: Use your knowledge of how to plot your data points and how to zoom with Zoomstat in order to see that your regression equation is a good-fit.

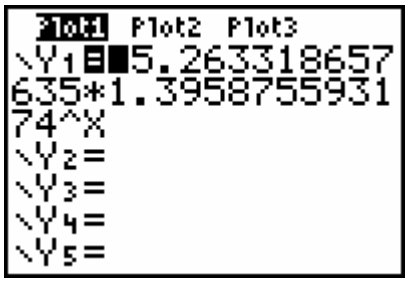


To Enter the Regression Equation in Y= (2 ways)

Note: You must complete the steps above to find the

regression equation line first before you can enter it into Y=.

(1) Press [Y=].
(2) Press [**VARS**]
(3) Arrow down to the #5 option: *Statistics*
(4) Arrow to the right *EQ*.
(5) Arrow down to the #1 option: *RegEQ*
(6) Press [**ENTER**]



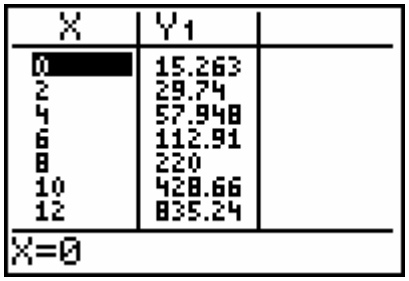
OR

(1) Complete the steps to finding the regression equation but in step (4) only press [**ENTER**] once.
(2) Press [**VARS**]
(3) Arrow to the right to *Y-VARS*.
(4) Arrow down to the #1 option: *Function…*
(5) Arrow down to the #1 option: Y_1
(6) Press [**Enter**] twice.

To find the predicted values:

Note: Your Regression Equation **must** be in your Y=.

(1) Press [**2nd**].
(2) Press [**WINDOW**] : (*TableSet*)
(3) Adjust appropriately:
TblStart = the starting point of your table set based on the lowest x-value of your data. Set this at 0 for this example.
ΔTbl = the change between data values, how much you want your table to increase by. Set this at 2 for this example.
(4) Press [**2nd**]
(5) Press [**GRAPH**]: (*Table*)
(6) Record the y-values in the table. These are the predicted values.



To Find the Error:

(1) Press 2nd and press Mode to quit.
(2) Press [**2nd**]
(3) Press [**STAT**] : (*List*)
(4) Arrow down to *RESID*
(5) Press [ENTER]

Note: You can use the right and left arrows to see all the errors on the screen. The errors are approximately {-.2633, .2599, 2.052, -2.909, 0}.

To Find the Square of the Errors:

(1) Follow the steps above to compute the Error first.
(2) Press [2nd]
(3) Press [(—)]: negative button→(Ans)
(4) Press [x^2]
(5) Press [ENTER]

Note: The square of the errors is approximately {.0693, .0675, 4.2121, 8.4633, 0}.

To find the SSE: Sum of the Squared Errors:

(1) Follow the steps above to compute the Square of the Errors
(2) Press [2nd]
(3) Press [STAT]: (List)
(4) Arrow to the right to Math
(5) Arrow down to the #5 option: sum(
(6) Press [ENTER]
(7) Press [2nd]
(8) Press [(—)]: (Ans)
(9) Press [ENTER]

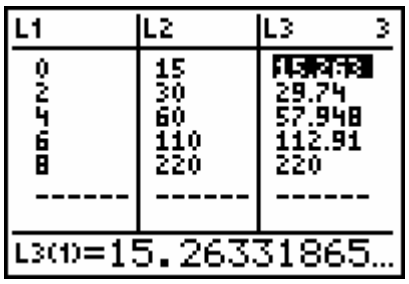
Note: Your SSE for this example should be approximately 12.8124.

Using the Lists to compute the predicted values, the errors, and the square of the errors:

(1) Press [STAT]
(2) Arrow down to #1 option: EDIT
(3) Press [ENTER]
(4) Enter x-values in L1
(5) Enter y-values in L2: (Note: these are the actual values)

Using L3 to compute the predicted values

(1) Arrow up to L3 (it should be highlighted)
(2) Press [VARS]
(3) Arrow to the right to Y-VARS.
(4) Arrow down to the #1 option: Function…
(5) Press [ENTER]
(6) Arrow down to the #1 option: Y_1
(7) Press [ENTER]
(8) Press [(]
(9) Press [2nd]
(10) Press [1]: L1
(11) Press [)]
(12) Press ENTER

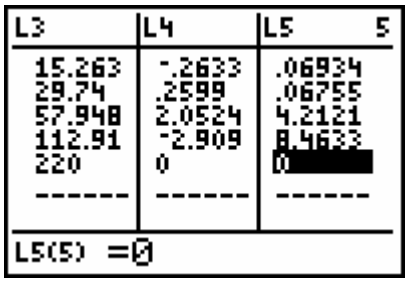


Using L4 to compute the error s:

(1) Arrow up to L4 (it should be highlighted)
(2) Press [2nd]
(3) Press [2]: L2
(4) Press [—]
(5) Press [2nd]
(6) Press [3]: L3
(7) Press [ENTER]

Using L5 to compute the squares of the errors:

(1) Arrow up to L5 (it should be highlighted)
(2) Press [2nd]
(3) Press [4]: L4
(4) Press [x^2]
(5) Press [ENTER]



To find the SSE: Sum of the Squared Errors using the Lists:

(1) Quit out of the lists by Pressing 2nd and then Mode
(2) Press [2nd]
(3) Press [STAT]: (List)
(4) Arrow to the right to Math
(5) Arrow down to the #5 option: sum(
(6) Press [ENTER]
(7) Press [2nd]
(8) Press [5]: L5
(9) Press [ENTER]

Note: Your SSE for this example should be approximately 12.8124.

To find the Average Error:

Note: The formula for average error is

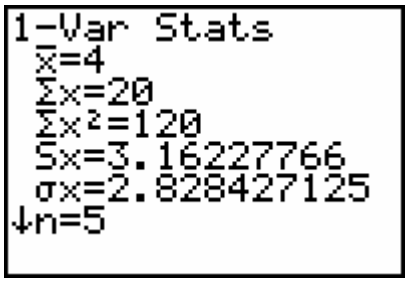
(1) Press [2nd]
(2) Press [x^2]
(3) Enter your SSE result, or press 2nd and (--) if you computed the SSE just prior to this.
(4) Press [÷]
(5) Enter the number of x values listed in L1
(6) Press [)]
(7) Press [ENTER]

Note: In this example, there are 5 x values and your final average error should be approximately 1.6008.

To Find Statistical Data

(1) Press [STAT]
(2) Arrow down to #1 option: EDIT
(3) Press [ENTER]
(4) Enter x-values in L1
(5) Enter y-values in L2
(6) Press [STAT]
(7) Arrow to the right to CALC
(8) Arrow down to the #1 option: 1-VarStats
(9) Press [Enter] twice

Note: If you have followed this packet straight through, you should already have steps 1-5 completed. Also, the following symbols are presented after this calculation is complete. These symbols are paired with their definitions below:



$\bar{x}$ = the mean
$\sum x$ = the sum of all the x values
$\sum x^2$ = the sum of all the squared x values
Sx = the sample standard deviation
σx = the population standard deviation
n = the total number of data values