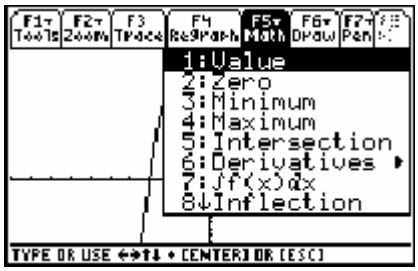
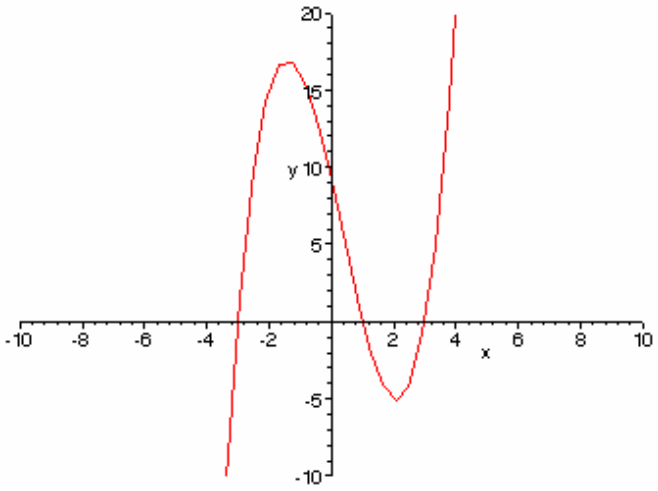
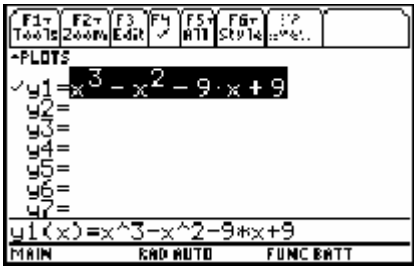
THE MATH MENU: F5





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 Alpha (Green key with diamond)
(2) Press F1
(3) Type the *f(x)*, the desired fuction: $x^3 - x^2 - 9x + 9$ next to $Y_1 =$.
(4) Press ENTER.

To graph this function in a standard window:

(1) Press F2: Zoom
(2) Arrow down to the #6 option: *ZStandard*. Press ENTER.

Note: We cannot see the relative maximum, so we need to increase the *Ymax* value. To do this, press **Alpha**, F2 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 F5 (Math)
(2) Arrow down to the #3 option: *Minimum*. Press **ENTER**.
(3) It will ask for a *Lower Bound*. Move the flashing cursor to the *lowest* part of the graph. Press **ENTER**.
(4) It will then ask for an Upper *Bound*. Move the flashing cursor to the *highest* part of the graph. 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 F5 (Math)
(2) Arrow down to the #4 option: *Maximum*. Press **ENTER**.
(3) It will ask for a *Lower Bound*. Move the flashing cursor to the *lowest* part of the graph. Press **ENTER**.

(4) It will then ask for an *Upper Bound*. Move the flashing cursor to the *highest* part of the graph. 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 F5 (Math)
(2) Arrow down to the #2 option: *Zero* (*root*) and press ENTER.
(3) It will ask for a *Lower Bound*. Move the flashing cursor slightly to the left of one of the zeros. Press **ENTER**.
(4) It will then ask for an *Upper Bound*. Move the flashing cursor slightly to the right of the same zero. Press **ENTER**.
(5) It will ask for a *Guess*. Move the flashing cursor **near** the zero. Press **ENTER**.

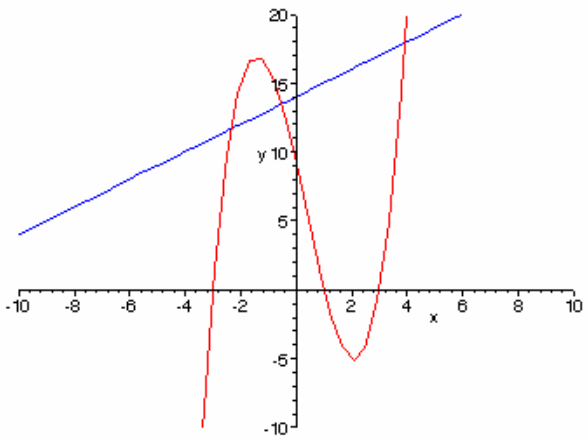
Note: You will need to repeat these steps for each zero. In this case, there are three zeros, so repeat three times. These values are at the bottom of the screen $x = -3$ $y = 0$, $x = 1$ $y = 0$, $x = 3$ $y = 0$. They are the coordinates of the zero. The zeros are (-3,0), (1,0) and (3,0).

To evaluate f(4).

(1) Press F5 (Math)
(2) Arrow down to the #1 option: *Value* and press ENTER.
(3) In the lower left hand corner of the screen, there will be X=. Key in a number. For this example, enter in 4. Press **ENTER**.
(4) 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) Go to F5 (Math)
(2) Arrow down to option #5: Intersection. Press ENTER.
(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 the lower bound of the intersection point. Move your cursor to the left of the intersection point.
(6) It will ask for the upper bound of the intersection point. Move your cursor to the right of the point of intersection.

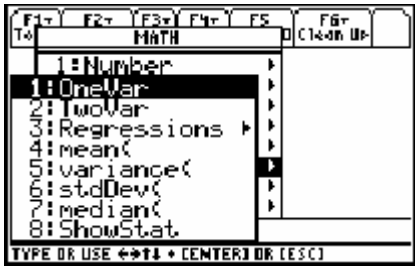
Note: You will need to repeat these steps for each point of intersection. In this case, there are three points of intersection, so repeat three times.
These values are at the bottom of the screen. They are the coordinates of the zero.

$x = -2.349967$ $y = 11.650033$
$x = -.5461107$ $y = 13.453889$
$x = 3.8960774$ $y = 17.896077$

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

Note: Before you continue on to the next section, be sure that you start from the home screen by pressing 2nd and then the Esc button.

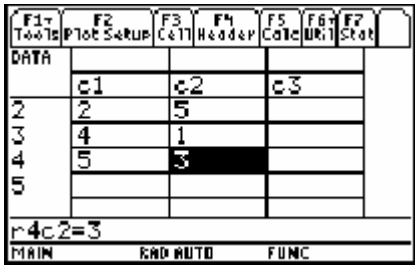
THE STAT MENU



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

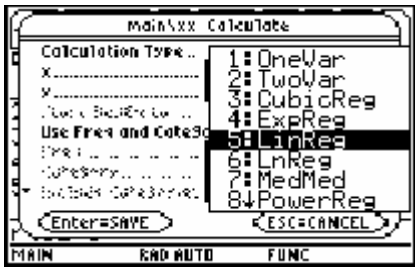
x	1	2	4	5
y	4	5	1	3

To Enter Data into L1, L2



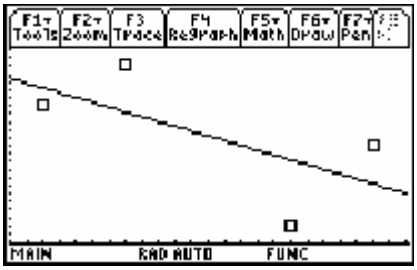
(1) Press APPS
(2) Arrow down to Data-Matrix Editor
(3) Press Enter
(4) Select Current by pressing Enter
(5) Enter x-values in C1
(6) Enter y-values in C2

To Find a Regression Line or Best-Fit Line



(1) Go to F5
(2) Next to Calculation Type press the Right Arrow and then arrow 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 Linear Regression equation is the best-fit, so choose options # 5.
(5) Where it says x, enter C1. Where it says y, enter C2.
(6) Where it says Store RegEq, press the right arrow, select y1(x), and press Enter.

(7) Freq and categories keep on NO.
(8) Press Enter and a Screen will Pop up with the formulas and values of a and b.
(9) Press Enter to return to the table.

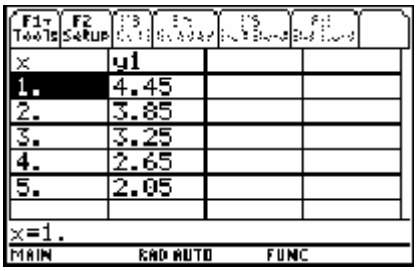


Note: Use your knowledge of how to plot your data points and how to zoom with ZoomData in order to see that your regression equation is a good-fit.

To find the predicted values:

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

(1) Press Alpha F5
(2) To adjust your Table appropriately press alpha F4:
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 1 for this example.
(3) Press **Enter**
(4) Record the y-values in the table. These are the predicted values.

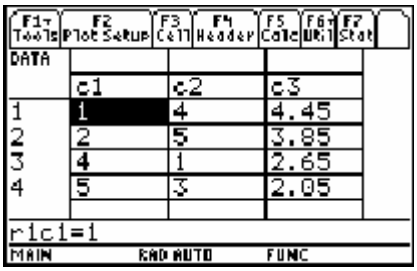


Using the Lists to compute the predicted values, the errors, and the square of the errors:

(1) Press APPS
(2) Arrow down to Data-Matrix Editor
(3) Press Enter
(4) Select Current by pressing Enter

Using L3 to compute the predicted values

(1) Highlight c3
(2) Press Enter
(3) Type in y1(c1) and hit enter

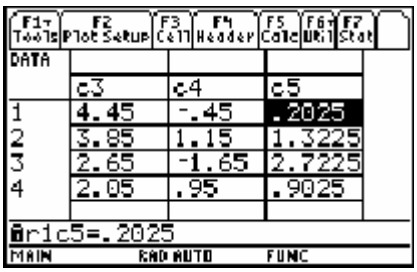


Using L4 to compute the error s:

(1) Highlight c4
(2) Hit Enter
(3) Type (c2-c3)
(4) Hit Enter

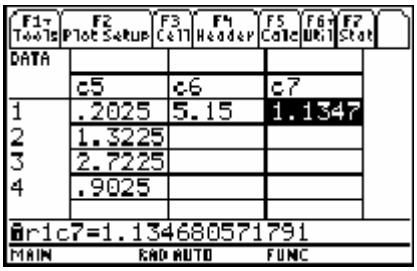
Using L5 to compute the squares of the errors:

(1) Highlight c5
(2) Hit Enter
(3) Type c4^2
(4) Hit Enter



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

(1) Stay in the Data Screen
(2) Go to c6
(3) Hit Enter
(4) Hit 2nd 5: Math
(5) Arrow to List and hit Enter
(6) Hit #6 : sum(
(7) Inside the parentheses type (c5)
(8) Hit Enter



Note: Your SSE for this example should be approximately 2.7225.

To find the Average Error:

Note: The formula for average error is

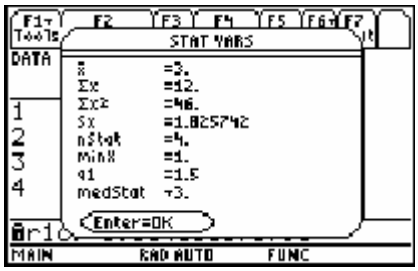
(1) Highlight c7 and press Enter
(2) Press [2nd]
(3) Press [x] : (the square root sign)
(4) Enter c6.
(5) Press [÷]
(6) Enter the number of *x* values listed in L1, in this case 4.
(7) Press [)]
(8) Press [ENTER]

Note: In this example, there are 4 *x*-values. The final average error should be approximately 1.1347.

To Find Statistical Data

(1) While still in the screen, hit F5
(2) Under calculation types, Hit the right arrow, highlight *onevar,* and Press Enter
(3) In x, type in c1
(4) Hit Enter

Note: 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