To graph a function:

1. The equation must be written in functional notation in "y equals" form. (Y is the dependent variable and X is free to vary.)

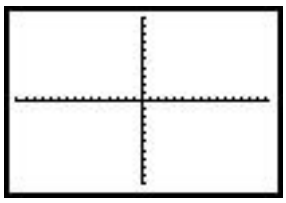
2. Hit the [Y=] key, then enter the righthand side of the equation. (If Plot1, Plot2, or Plot3 is highlighted, you may want to arrow up to the Plot and hit [ENTER], then arrow down. This un-selects the plot. Otherwise, you will likely see the scatter plot along with your graph.)

3. To view a table with values that your equation produces, enter [2nd] [TABLE]. To change the starting value in the table or the increment between X values in the table, enter [2nd] [TBLSET]. Generally, we keep the "AUTO AUTO" options selected in order to get an automatic table of X and Y values.

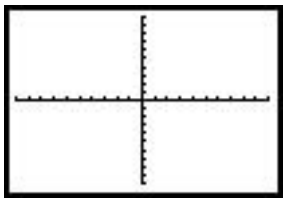
4. To graph, you have several options.

   You may enter [WINDOW], adjust the window (max, min values, and scales), then hit [GRAPH]; or, you may choose one of the ZOOM options:

   [ZOOM] [5] (Zsquare) gives a rectangular window in the same proportion as the actual screen with X values typically ranging from -15 to 15 and Y values ranging from -10 to 10.



   [ZOOM] [6] (Zstandard) gives a standard window with X values ranging from -10 to 10 and Y values ranging from -10 to 10.



Examples:

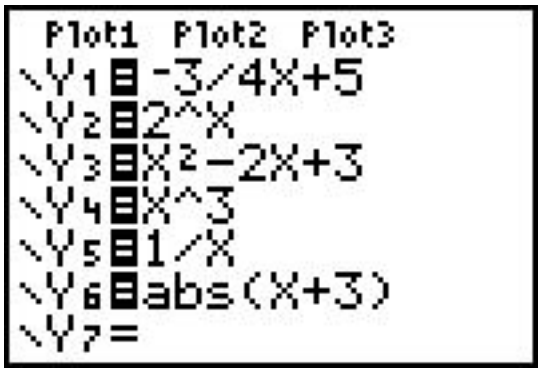
Graph the following functions in an appropriate window.

(1) $y = -\frac{3}{4}x + 5$ (2) $y = 2^x$ (3) $y = x^2 - 2x + 3$

(4) $y = x^3$ (5) $y = \frac{1}{x}$ (6) $y = |x + 3|$

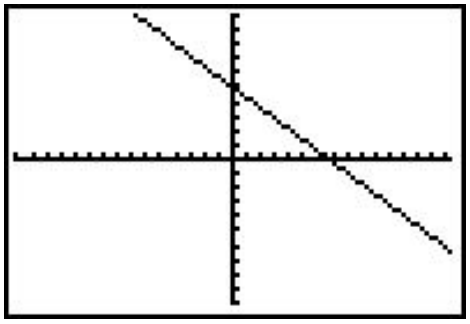
Solutions:

This is how the function display should appear for the 6 functions.

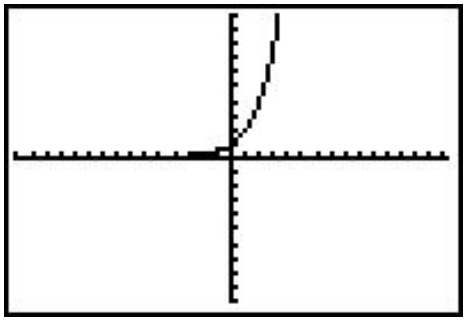


The graphs of the functions given in #1-6 above should look something like these. (In each case, we're using the "ZSquare" window from the ZOOM menu.):

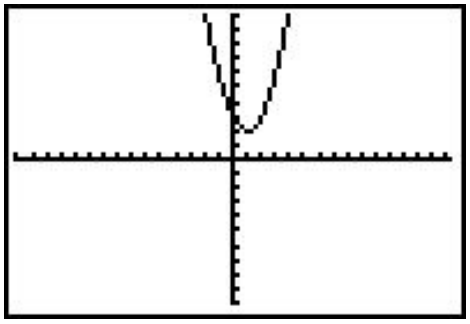
(1) $y = -\frac{3}{4}x + 5$



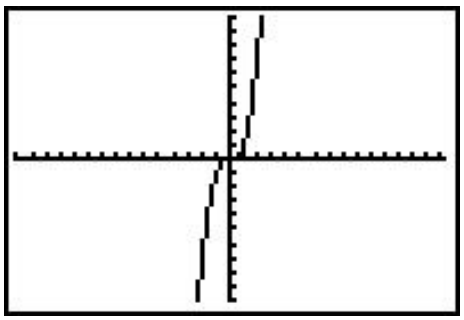
(2) $y = 2^x$



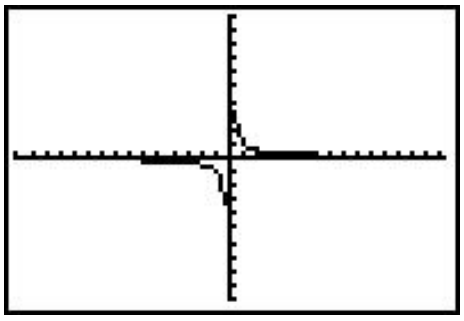
(3) $y = x^2 - 2x + 3$



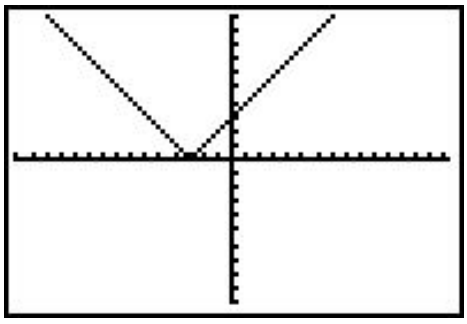
(4) $y = x^3$



(5) $y = \frac{1}{x}$



(6) $y = |x + 3|$ "abs" is in the MATH function key under "NUM"



To graph a circle:

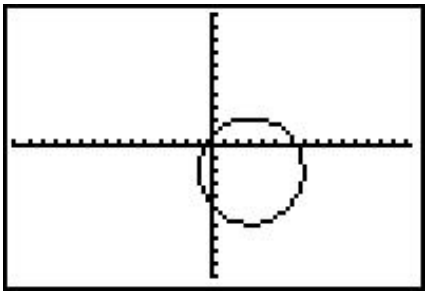
1. A circle can be graphed by specifying its center (h, k) and radius, r.

2. Hit [2nd] [DRAW] [9] : Circle(. Then enter the coordinates of the center and the radius, separated by commas, with a closing parenthesis.

3. Depending on your window settings, the graph may not look like a circle. To make the graph look like a circle, choose the [ZOOM] [5] option before asking for the circle:

   [ZOOM] [5] [2nd] [QUIT] [2nd] [DRAW] [9] . . .

   The graph of the relation given by $(x-3)^2 + (y+2)^2 = 16$ is accomplished with the Circle(3,-2,4) command and should look something like this:



To evaluate a function for a given x value:

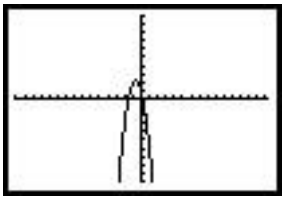
Any function stored in the [Y=] list can also be evaluated from the computation screen. For example, if $Y_1 = 2X - 1$, you can evaluate the function at x = -5.

While in the computation screen, hit [VARS] then arrow right to Y-VARS, [ENTER] (on Function), then [ENTER] (on Y1), then type [(] [-5] [)], then [ENTER]. You should see the answer -11.

Another way is to go to [2nd] [TBLSET]. Select the "ASK" and "AUTO" options. When you go back into [2nd] [TABLE], the table is blank. You input any X-value, and the calculator will compute the corresponding Y-value using the formula. Pay attention to the column headings in your table.

Examples:

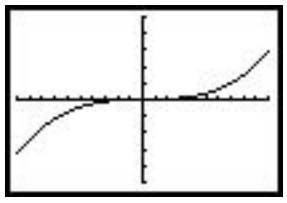
(7) If $y = f(x) = -3x^2 - 4x + 1$, find



(a) f(-3) (b) f(0) (c) f(1) (d) f(2.5)

Solutions:

(a) -14 (b) 1 (c) -6 (d) -27.75



(8) If $y = 3x^3 - 2x^2 + 6x - 1$, find

(a) f(-2) (b) f(0) (c) f(2/3) (d) f(5)

Solutions:

(a) -45 (b) -1 (c) 3 (d) 354

To find maximum and minimum values and zeros:

Once a function is graphed, options in the [CALC] menu (under [TRACE]) can be used to locate maximum and minimum values and zeros of the function.

Example: $Y1 = -3x^2 - 4x + 1$

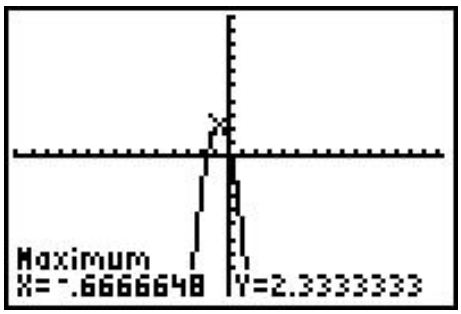
To find the maximum (or local maximum) of the function, have the graph in the viewing window. Then hit [2nd] [CALC] [4] : maximum.

The calculator asks for a left bound. Enter an x-value to the left of the maximum, and then hit [ENTER].

The calculator then asks for a right bound. Enter an x-value to the right of the maximum, then hit [ENTER].

The calculator next asks for a guess. Enter an x-value near the maximum and hit [ENTER]. The coordinates for the approximate maximum are given.

For the given quadratic function, the maximum value is 2.3333333 . . . or $2\frac{1}{3}$, and it occurs when x is -0.6666648. (Here, the calculator is off a bit; the exact answer is $-\frac{2}{3}$ or $-0.\overline{6}$.)



To find the minimum (local minimum), use option 3 in the CALC menu.

To find the zeros (x-intercepts) of a function, use option 2 in the CALC menu.

You may want to try finding some of these features of the graph of $y = 3x^3 + 6x^2 - 2x + 3$.

To find a point of intersection of two graphs:

Both functions must be entered into [Y=] (perhaps Y_1 and Y_2). With the graphs in the viewing window, hit [2nd] [CALC] [5]: intersect.

Press the up or down arrow until the cursor is on the first graph. [ENTER]. Press the up or down arrow until the cursor is on the second graph. [ENTER] Move the cursor near the point of intersection for your "guess". [ENTER]

The x- and y- coordinates of the point of intersection are then given.

Examples:

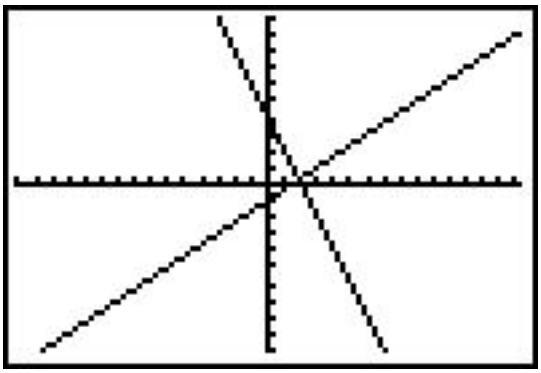
Find the point(s) of intersection for each of the given systems:

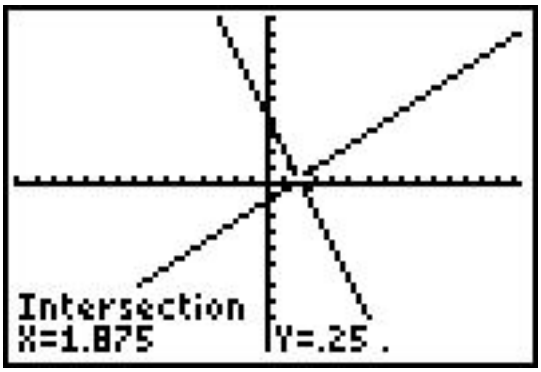
(9) $y = -2x + 4$
$y = \frac{2}{3}x - 1$

(10) $y = -3x^2 - 4x + 1$
$y = -2x + 1$

Solutions:

(9)





(10)