Graphing on the 89

The graphing utilities are in green above the function keys.

F1 F2 F3

Press ◇ F1 , to enter the **y=** menu.

On the screen, **y1=** should appear.

Now, if you have the equation of the form $y = \frac{3}{2}x - 1$ or $y = 2x^2 + 10x - 5$, this is called *y-equals* form and you can enter it into the calculator. Put the cursor next to **y1=** and press ENTER to move to the input line. Type-in the equation and finally press ENTER , again.

The ✓ symbol means the equation is engaged.

Type ◇ F3 to graph.

The **function keys** let you reach many useful menus. ESC leaves the menu that you are currently in.

Now graph:

y1=$\sqrt{(x)}$
y2= abs(x)

(Either use your ALPHA key to type abs(x), or use CATALOG. abs is the first choice.)

Once you have seen the graphs, use the CLEAR to erase **y1** and **y2**.

Now graph the following.

y1= x^5 − 8 ∗ x^3 + 6 ∗ x

A nice feature of the calculator is to allow you to evaluate the graph at any given value of x inside the window. For example, if you wanted to know the value of y when $x = 5.4$, type F5 1 .

You are prompted for an x value. Type **5.4** ENTER . The result is **3364.3382**. Your only limitation is that the x-value must be between xmin and xmax in the **WINDOW** menu.

This last graph has a lot of high and low points, called local minimum points or local maximum points. In later classes, you will be interested in finding such points. One way we can estimate the high or low points is to use the **TRACE** menu, press F3 .

Along the bottom of the screen, are figures

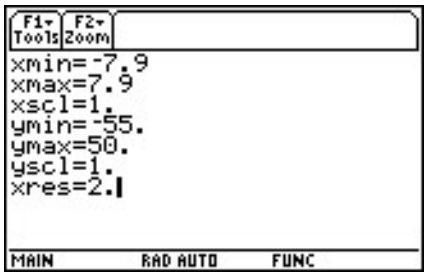
xc: yc:

This is the location of the cursor, (the blinking cross-hairs).

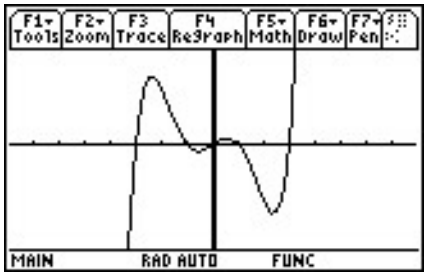
Try pressing the arrow buttons. What happens?

Notice as you move the cursor, the $x =$ and $y =$ values change, these values represent the coordinates of the cursor. Notice that it is not very exact, and the numbers involved are very ugly.

Press ◇ F2 for the **WINDOW** menu. This gives the dimensions of the viewing window. Any changes here will affect your view of the graph. Set the values as illustrated.



Press ◇ F3 to graph. You should have this screen.



Now try tracing. Notice that the $x =$ numbers are all 1 decimal place numbers. This has to do with the size of the screen, (158 pixels) and the use of 7.9 for the x-values. Try to find the coordinates of the local maximum around $x = -2$. You can not get very accurate, can you?

Let's try to use the **Zoom** menu. Press F2 for zoom.

ZoomBox Box zoom. Use the cursor to draw a box around the desired area, pressing ENTER to set the corner of the box. Once the box is set, press ENTER .

ZoomIn Zoom in. Position the cursor where you want to zoom in, and press ENTER .

ZoomOut Zoom out. Position the cursor where you want to zoom out, and press ENTER .

ZoomStd Zoom standard. Always returns to the standard window of -10 to 10 for both x and y.

ZoomPrev Zoom to the previous view. Lets you back up once. if you zoomed the wrong way.

Try to zoom in on the local maximum around $x = -2$.

What do you get?

Another way to find minimums or maximums is to use an option in the **MATH** menu.

Press [F5] to see the math options.

The **Minimum** and **Maximum** invoke numerical procedures to find the minimum and maximum values.

We are looking for a local max., so press [4] for **Maximum**. The cursor starts somewhere on the graph. Use the arrow keys to position the cursor to the left of the local max. and press [ENTER] . Now, use the arrow keys to position the cursor to the right of the local max. and press [ENTER] . The cursor jumps to the local max. How close were you earlier?

Another common type of problem is to find the x-intercepts or zeros for a graph.

Use **ZoomStd** to redraw our graph. Now press [F5] [2] . Again, the cursor will start on the graph, so you must use the arrow keys to enter the left bound and the right bound. You must press [ENTER] each time. The cursor moves to the zero, and displays the x and y values of the point on the graph. The y-value should be close to 0.

Finally, you may be asked to find a point where two graphs cross, called the intersection.

On your calculator, graph $y1 = 3x^2 - 5$ and $y2 = 2x + 1$.

Notice that the graphs cross in two places.

Press [F5] [5] .

The cursor appears on the 1^{st} graph at some point. Press [ENTER] to indicate the 1^{st} graph. The cursor is now on the 2^{nd} graph. Press [ENTER] to indicate the 2^{nd} graph. Move the cursor to a point that is to the left of the intersection and press [ENTER] . Now, move the cursor to a point to the right of the intersection and press the [ENTER] . The cursor jumps to the intersection, and gives the x and y values.

Done in LaTeX.