



hp calculators

HP 39gs Graphing made simple

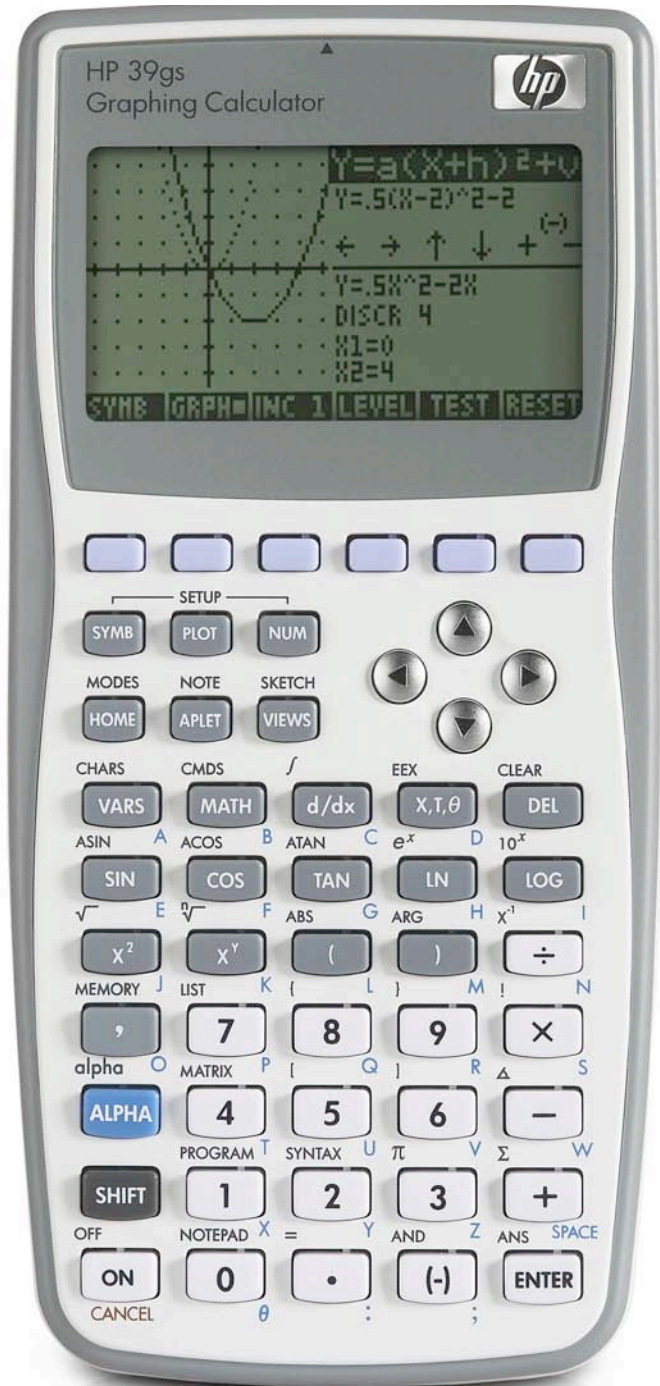
Step 1: Choose an Aplet

Step 2: Enter a Function

Step 3: PLOT

Step 4: Adjust Axes

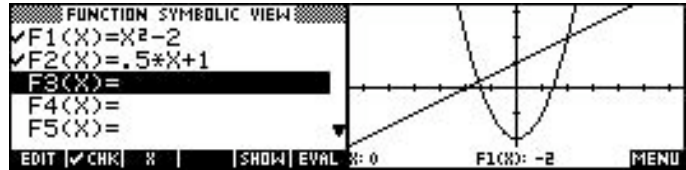
A table of values



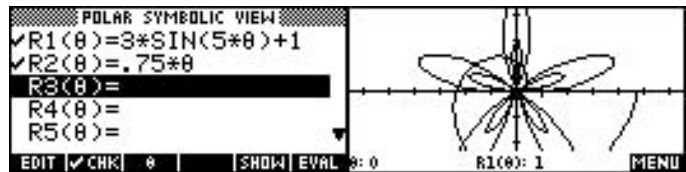
Step 1: Choose an Aplet

The choice of aplet to use when graphing depends on the type of function. There are three primary aplets provided for graphing – the Function aplet, the Polar aplet and the Parametric aplet. In addition to those three, most of the other aplets have some kind of graphical display to one degree or another.

If you have a rule of the form $f(x) = x^2 - 2$ or $y = \frac{1}{2}x + 1$ then you should use the Function aplet. Notice that there is no need to enter the “ $f(x) =$ ” portion.



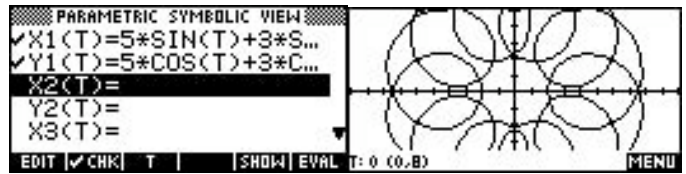
A polar equation is of the form $r(\theta)$. If you have a rule of this type then you should use the Polar aplet.



Parametric equations are rules where both x and y are functions of a third parameter t.

The graph shown right has the equation

$$\begin{cases} x(t) = 5 \sin(t) + 3 \sin(11t) \\ y(t) = 5 \cos(t) + 3 \cos(11t) \end{cases}$$

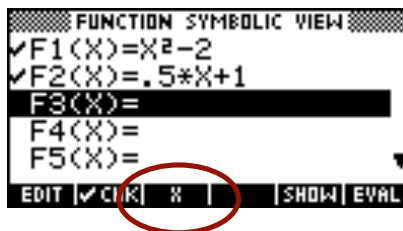


Although other aplets have plot views, such as the Statistics, Inference and Sequence aplets shown below, they may not be the primary focus of the aplet in the way that they are for Function, Polar or Parametric.



Step 2: Enter a Function

The SYMB (Symbolic) view is usually used to enter equations and functions. Simply type your expression and press ENTER or OK. To overwrite an existing entry press DEL or just type over it. Press SHIFT CLEAR to delete all functions. The SYMB view for the Function aplet is shown but others are similar. The $\boxed{X,T,\theta}$ button is normally used to enter X in an expression (T or theta in other types of equations). Using ALPHA is also possible, as is using screen key 3 (circled below).



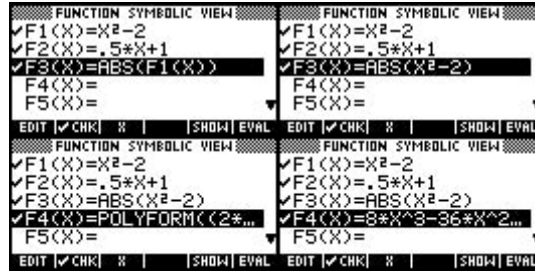
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The ✓ mark next to the function determines whether the function is to be graphed or ignored. Use **CHK** (screen key 2) to add or remove the ✓ mark.

MATH functions can be used within expressions and one function can reference another.

Highlighting an expression and pressing EVAL (evaluate) will produce a simplified version if an expression contains a reference to another function. See below for two examples. Tip: This can also be used to copy an expression. To copy F1(X) to F3(X) just set up F3(X)=F1(X) then highlight and EVAL.

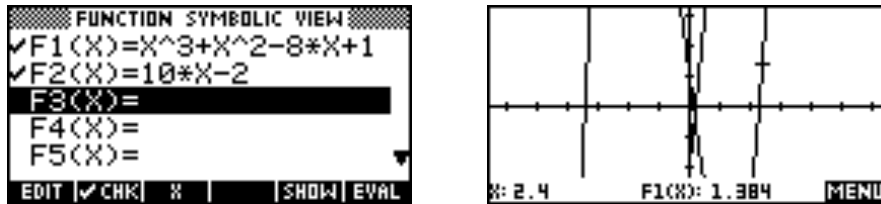


Step 3: PLOT

Just press PLOT to produce a graph. If the result is not clear and the next step may be to Adjust Axes.

The coordinates of the current position are displayed. Although it may not be immediately obvious, a small cross (circled) marks the cursor. Pressing **→** and **←** will move the cross along the currently selected graph in steps of 0.1.

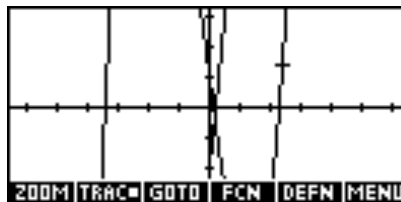
The initially selected graph is always the first one which has a ✓ mark in the SYMB view. Pressing **▲** (or **▼**) will move to the next graph which has a ✓ mark in the SYMB view.



If you are not sure which graph is which then press the MENU button (screen key 6) and then press DEFN (screen key 5).

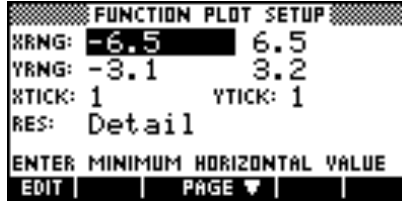
To jump to a specific point, press the GOTO button (screen key 3). This will request a value and display coordinates for that point. The value specified need not be currently on the screen and can be the result of a calculation such as \sqrt{e} .

To move the cross independently of the graphs, press TRACE (screen key 2). The default is to have TRACE selected (**TRAC=**).

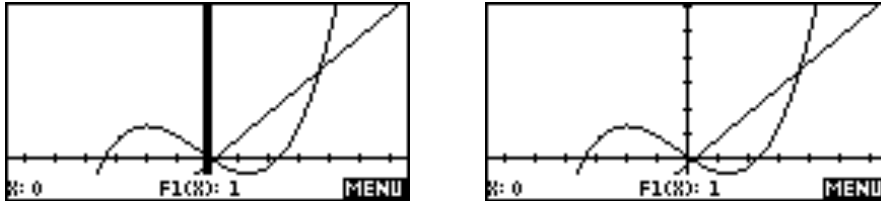


Step 4: Adjust Axes

If the default set of axes are not satisfactory then press SHIFT PLOT to access the PLOT SETUP view shown below.



Enter the minimum and maximum values for the axes as XRNG and YRNG. The values of XTICK and YTICK control the 'ticks' on the axes. The differences are shown in the graphs below. In the one on the left, the YTICK value is equal to 1, while in the one on the right, the YTICK value is equal to 10.

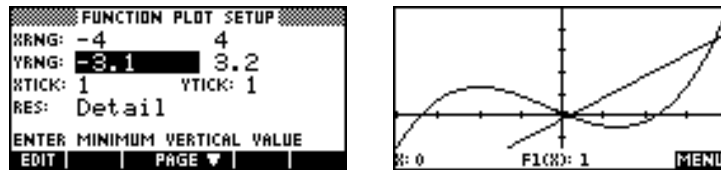


As can be seen above, there is a band at the bottom of the screen which is use to display coordinates and the function MENU. Pressing MENU once will display the list of function tools. Pressing it again will display the graph on the entire screen. Pressing a third time goes back to the coordinate display.

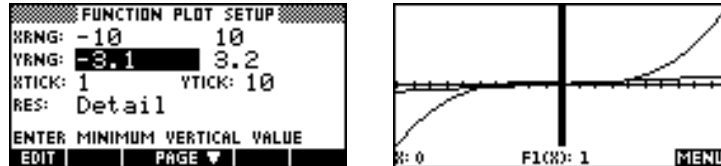
Two extra tools are provided for use in adjusting axes. These are Auto scale and ZOOM. Auto scale is found on the VIEWS menu and it automatically finds a y axis scale which will display the entire graph for the x axis you have chosen. Auto scale always scales on the first function with a ✓ mark in the SYMB view.

For example, using the previously defined functions...

An x axis of -4 to 4 gives....



... but an x axis of -10 to 10 gives the less satisfactory result shown below, where the y axis is far too long.



It is usually a good idea to go back to PLOT SETUP after Auto scaling and 'clean up' the choice. Clearly it still helps to have some idea of the shape of the function before graphing it!

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The ZOOM functions are available in the PLOT view by pressing MENU, then ZOOM. The Box option is the one most often used to zoom in, but in the example shown right, the Y-Zoom Out option was used to obtain a better choice for the y axis. The default is to zoom in or out by a factor of 4.



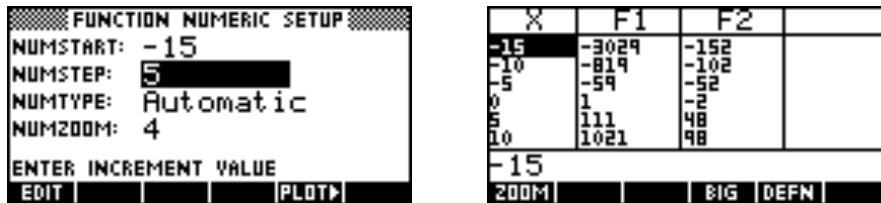
A table of values

It is often helpful to display a table of values for your function. On the hp 39gs, just press NUM to enter the Numeric view.

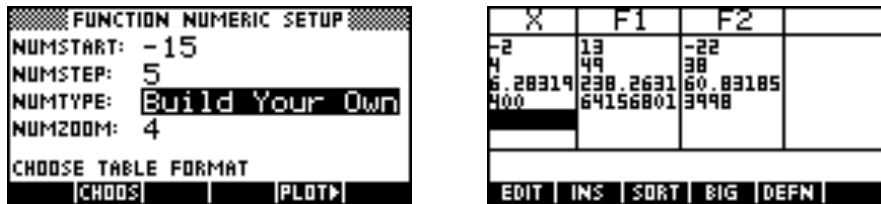
X	F1	F2
0	1	-2
.1	.211	-1
.2	-.552	0
.3	-1.283	1
.4	-1.976	2
.5	-2.625	3

Press \uparrow or \downarrow to scroll through the list. Alternatively, simply type in a value and press ENTER to have the list jump directly to that value.

If the step size for the table is not satisfactory then press SHIFT NUM to enter the NUM SETUP view. Change the value of NumStep to any desired step size.



Changing the NumType from Automatic to Build Your Own allows you to enter any values you choose into the table.



Pressing BIG (screen key 4) will display the values using a larger font.

X	F1	F2
-2	13	-22
4	49	38
6.28319	238.263	60.83185
400	6.416E7	3998