HEWLETT PACKARD

HP 39G/40G

Quick Start Guide

Algebraic Graphing Calculator

HP39G/40G
QUICK START GUIDE

Version 1.0

Contents

Introduction

The HP 39G/40G is an algebraic-entry graphing calculator with advanced features for:

- easy retrieval of previous answers and entries
- displaying algebraic expressions in standard textbook format
- generating tables
- displaying two graphs or a graph and a table on a split-screen
- working with functions, parametric and polar equations
- working with sequences (including recursion)
- solving equations
- computing statistics
- testing hypotheses
- calculating confidence intervals based on sample data
- symbolic algebra and tools for calculus
- operating with vectors, matrices, lists, and complex numbers
- drawing and annotating diagrams
- saving and sharing settings and equations
- programming.

This guide is intended to give you an overview of the basic features of the HP 39G/40G.

Conventions

The following conventions are used in this guide to represent the keys that you press and the menu options that you choose to perform the described operations.

- Keys are represented as follows:
  [SIN], [COS], [HOME], etc.
- Shift keys, that is the key combinations that require you to press the [SHIFT] key first, are represented as follows:
  [SHIFT] *CLEAR*, [SHIFT] *MODES*, [SHIFT] *ACOS*, etc.
- Numbers and letters are represented normally, as follows:
  5, 7, A, B, etc.
- Menu options, that is, the options you select by pressing the menu keys at the top of the keypad, are represented as follows:
  STOP, **CANCL**, **OK**.
- Input form fields and choose list items are represented as follows:
  `Function`, `Polar`, `Parametric`.

- Your entries as they appear on the command line or within input forms are represented as follows:
  $2*X^2-3X+5$
- The arrow keys are represented as follows:

  [▲] [▼] [►] and [◄].

☞ A pointing hand appears to bring your attention to warnings, suggestions, helpful hints, shortcuts, or other important notes.

1. Basic Information

Hard cover

The cover of the HP 39G/40G slides off the front of the calculator and can be slid onto the back.

[ON] key

The [ON] key (lower left corner of the keyboard):

- turns on the calculator
- cancels operations

If you leave your calculator on for a few minutes without pressing any keys, it will automatically turn off to save battery power. When you press [ON] again, the screen reappears just as you left it. The memory of the calculator is maintained when the calculator is off.

Contrast control

To lighten or darken the screen to your preference, press and hold down [ON] while pressing [-] or [+], respectively.

Batteries

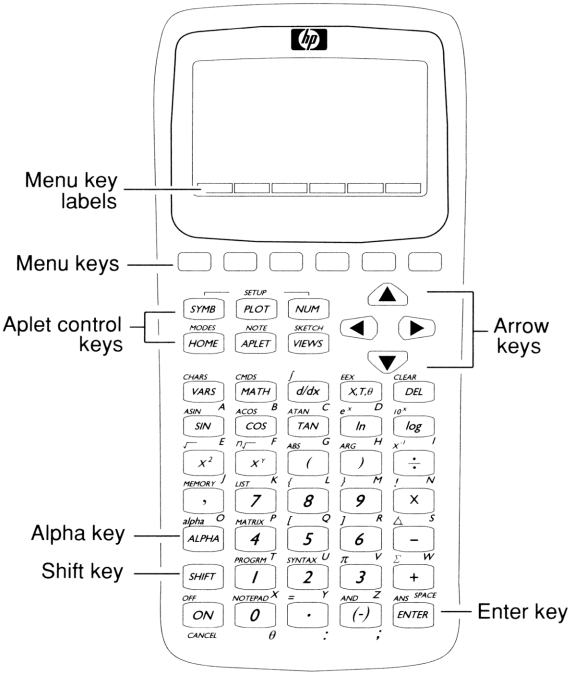
The HP 39G/40G takes three AAA batteries, which are located in the lower compartment in the back of the calculator. You should get several months' use out of a set of batteries. Even when you take the batteries out, the calculator's memory is maintained for a few minutes, giving you the opportunity to change the batteries without loss of stored information.

Ports

You will find 2 ports on the top edge of the HP 39G/40G:

- a 10-pin serial port for connecting to another calculator or a datalogger
- an infrared port for connecting to another calculator or printer.

The infrared port can be used only on the HP 39G.



Shift key

Directly above the [ON] key is the [SHIFT] key. Press [SHIFT] and another key to activate the operation or menu indicated by the blue label directly above that key. When the [SHIFT] key has been pressed, a shift symbol is displayed at the top left of the screen.

Alpha key and special characters

The [ALPHA] key enables you to enter the characters that are displayed below the other keys. When the [ALPHA] key has been pressed, α appears at the top of the screen.

☞ When typing several letters in a row, simply hold [ALPHA] down as you type.

Lower case letters are obtained by pressing [ALPHA] and [SHIFT] (in either order).

Greek letters and other special symbols are found in the SPECIAL CHARACTERS menu ([SHIFT] *CHARS*).

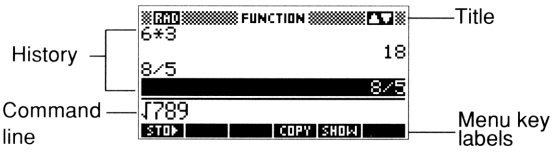
2. HOME

HOME is the primary work area for the HP 39G/40G.

Tour of HOME

To go to HOME, press [HOME].

Parts of the display



Menu key or **soft key labels.** The labels indicating the current use of the menu keys. STO▸ is the label for the first menu key. "Press STO▸" means to press the first menu key above the illustration.

Command line. The line of current entry.

History. In HOME you can see up to four lines of history: the most recent input and output. Older inputs and outputs are retained in memory, and can be displayed by pressing [▲] a number of times.

Title. The name of the current aplet is displayed in the title bar.

RAD, GRAD, DEG indicate whether Radians, Grads, or Degrees angle mode is set for HOME.

The ▼ and ▲ symbols indicate whether there is more history in the HOME display.

Annunciators. Annunciators are symbols that appear above the title bar and give you important status information.

Whenever an hourglass appears in the annunciator area, the HP 39G/40G is busy performing a calculation. Press [ON] while this annunciator is on to stop the computation.

The low battery annunciator ((•)) indicates that your batteries are getting low. (The calculator displays `Low Battery` when you first turn it on). You should change them within a few days.

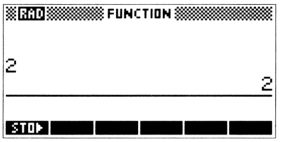
Entering

When you type, the characters appear on the command line until you press [ENTER].

Examples:

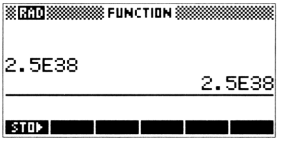
To enter 2 into the command line:

2 [ENTER]



To enter 2.5×10^{38}:

2 [.] 5 [SHIFT] *EEX* 38 [ENTER]



Deleting and clearing

To delete a character you have entered, press [▶] or [◀] until the cursor is over the character you want to delete, and press [DEL]. If the cursor is at the end of command line and you want to delete the last character, just press [DEL].

Press *CANCEL* ([ON]) while on the command line and the entire line is deleted.

[SHIFT] *CLEAR* ([SHIFT] [DEL]) clears all previous inputs and outputs in HOME.

☞ The cursor is always in insert mode in HOME. In other words, it always points to where the next character you type will be inserted.

Retrieving and editing

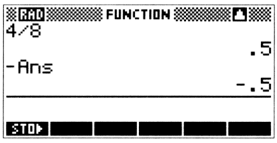
[SHIFT] *ANS* inserts the special variable `Ans` in the command line. The value of this variable is the last answer you obtained to an operation in HOME. This allows you to immediately use the result of the previous computation in a new computation without having to type it in.

In fact, until you press [SHIFT] *CLEAR*, a history of *all* your previous entries and answers is maintained on HOME. Simply press the [▲] key until you have highlighted the entry or answer you want, then press **COPY**. This copies the highlighted entry or answer into the command line.

To make changes, press the [◀] or [▶] key to position the cursor. Any characters you type are to the left of the cursor. Pressing [DEL] deletes the character underneath the flashing cursor. After you have made the changes you want, press [ENTER].

Examples:

Press [SHIFT] *CLEAR* and enter the following calculations:



3 [X] 2 [ENTER]

[(-)] [SHIFT] *ANS* (to reverse the sign of the last answer) [ENTER]

4 [÷] 8 [ENTER]

[(-)] [SHIFT] *ANS* (to reverse the sign of the last answer) [ENTER]

The first two computations you entered are now out of view, but they are still in HOME. Notice the ▲ showing in the upper right of your screen. This indicates that there are more entries and answers than currently displayed. To display earlier entries, press [▲] to activate the highlight bar. Now you can move up and down HOME pressing the [▲] or [▼] keys. (A small ▼ and ▲ appear on screen to tell you which directions it is possible to move.) Your calculator will flash an exclamation mark— ⚠ —when you reach the top or bottom of HOME.

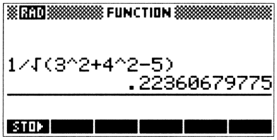
Showing an expression

If a previous entry or answer is highlighted, the SHOW menu key label is displayed. Press SHOW to display the entry or answer in standard textbook format. You can use it to check to see if you have entered an expression with the meaning that you intended.

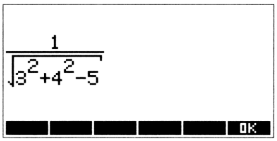
Example:

Suppose we want to evaluate the expression $1/\sqrt{(3^2+4^2-5)}$.

1 [÷] [SHIFT] √ [(] 3 [x^y] 2 [+] 4 [x^y] 2 [-] 5 [)] [ENTER]



Press [▲] twice to highlight the expression and press SHOW to display the expression in standard textbook format. When you are done looking at the typeset version, simply press OK.



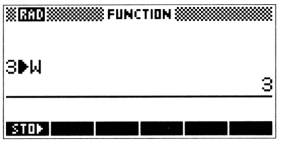
Storing numbers in variables

The letters A, B, C, . . . , X, Y, Z, and θ are reserved as variable names for real numbers. To store a number (or other object) under a variable name, enter the number or expression on the command line in HOME, press STO▶, type the name of the variable, and press ENTER.

Examples:

This example stores 3 to the variable W. If a symbolic expression contains W, then the HP 39G/ 40G will substitute the stored value.

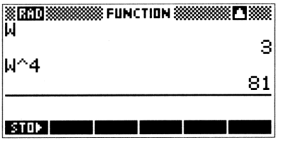
3 STO▶ ALPHA W ENTER



To recall the value, simply type the variable name and enter it.

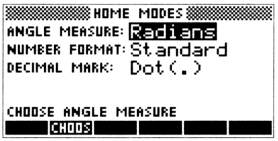
ALPHA W ENTER

ALPHA W x^y 4 ENTER



3. Modes

Press [SHIFT] *MODES* to see the settings that control how the HP 39G/40G displays the HOME screen to you.



Although the number format setting affects only HOME, the angle measure setting controls HOME and the current aplet.

Angle measure

There are three angle measure modes to choose from:

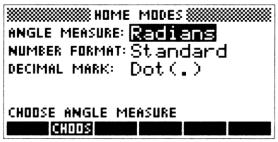
`Degrees`	There are 360 degrees in a full circle.
`Radians`	There are 2π radians in a full circle.
`Grads`	There are 400 grads in a full circle.

Setting the angle measure

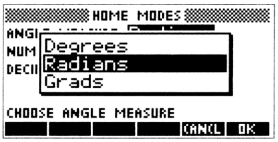
The following example demonstrates how to change the angle measure from the default mode, radians, to degrees for the current aplet. The procedure is the same for changing the decimal mark.

1. Press [SHIFT] *MODES* to open the HOME MODES input form.

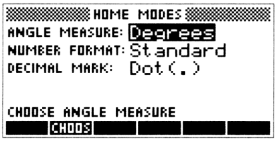
   The cursor (highlight) is in the first field, Angle Measure.



2. Press **CHOOS** to display a list of choices.



3. Press [▲] to select `Degrees`, and press **OK**. The angle measure changes to degrees.
4. Press [HOME] to return to HOME.



☞ Instead of pressing **CHOOS** and selecting an option from a menu, you can press [+] repeatedly until the option you want is displayed in the field.

Number format

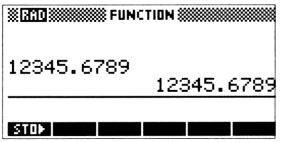
The standard numeric display mode of the HP 39G/40G is to display 12 significant digits (15 digits are used internally during computation). Your HP 39G/40G is in standard display mode if the number format reads `Standard`.

There are five number formats:

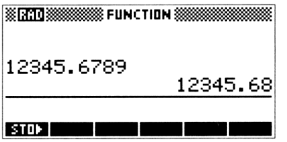
`Standard`	Up to 12 digits shown with a floating decimal point.
`Fixed`	Fixed number of decimal places, from 0 to 11.
`Scientific`	Exponential notation (exactly one digit to the left of the decimal point). Number of places after first significant digit can be 0 to 11.
`Engineering`	Exponential notation where the exponent is a multiple of 3. Number of places after first significant digit is can be 0 to 11.
`Fraction`	Numbers are displayed as fractions in "P/Q" format. The decimal precision of the result can be 0 to 11 places.

Examples:

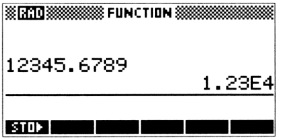
a. With `Standard` number format selected, go HOME and enter 12345.6789



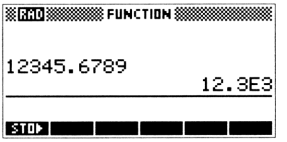
b. Press [SHIFT] *MODES*, [▼], CHOOS `Fixed` number format, specify 2 decimal places, and press OK. Press [HOME] and enter 12345.6789 again. The result is now displayed with 2 decimal places.



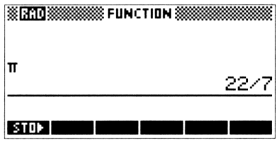
c. Press [SHIFT] *MODES*, [▼], CHOOS `Scientific` number format (still 2 decimal places), OK. Press [HOME] and enter 12345.6789 again. The result is displayed with an exponent, one digit to the left of the decimal point, and the specified number of decimal places.



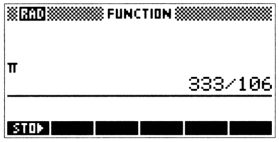
d. Press [SHIFT] *MODES*, [▼], CHOOS `Engineering` number format (still 2 decimal places), OK. Press [HOME] and enter 12345.6789 again. The result is displayed with an exponent that is a multiple of 3, and the specified number of significant digits beyond the first one.



e. Press [SHIFT] *MODES*, [▼], CHOOS Fraction number format (with 2 digits maximum), OK. Press [HOME] and enter π. The result is displayed as a fraction based on 2 decimal places.



f. Press [SHIFT] *MODES*, [▼], CHOOS Fraction number format (with 3 digits maximum), OK. Press [HOME] and enter π. The result is displayed as a fraction based on 3 decimal places.



☞ You will probably find that Standard format serves most general purposes best.

Decimal mark

You can also change the decimal mark from a period (.) to a comma (,).

Resetting the MODES

Press [SHIFT] *CLEAR* to reset all the modes to default settings.

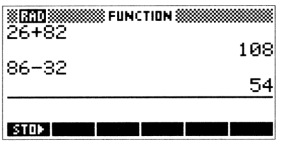
4. Computational Examples

The HP 39G/40G uses algebraic-entry notation (*not* Reverse Polish Notation or RPN). The following examples demonstrate the use of the basic arithmetic and function operations of the HP 39G/40G. Keystrokes are shown along with the resulting calculator display. All answers shown are for `Standard` number format.

Arithmetic operations

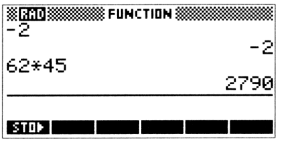
Addition: 26 [+] 82 [ENTER]

Subtraction: 86 [-] 32 [ENTER]



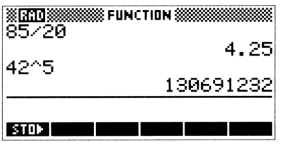
Negation: [(-)] 2 [ENTER]

Multiplication: 62 [×] 45 [ENTER]



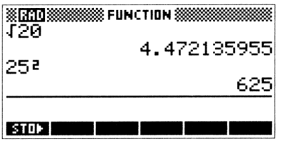
Division: 85 [÷] 20 [ENTER]

Exponentiation: 42 [x^y] 5 [ENTER]



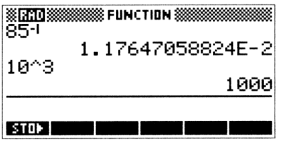
Square roots: [SHIFT] √ 20 [ENTER]

Squares (exponent 2 is shown as a superscript): 25 [x^2] [ENTER]



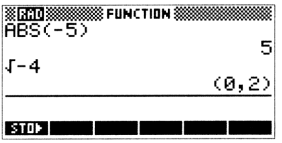
Reciprocals: 85 [SHIFT] x^{-1} [ENTER]

Powers of 10: [SHIFT] 10^x 3 [ENTER]



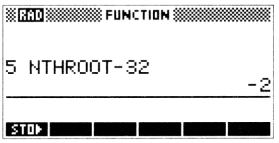
Absolute value: [SHIFT] *ABS* [(-)] 5 [)] [ENTER]

The square root of a negative number: [SHIFT] √ [(] [(-)] 4 [)] [ENTER]



Nth roots: $\sqrt[5]{(-32)}$.

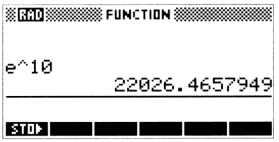
5 [SHIFT] $\sqrt[n]{}$ [(] [(-)] 32 [)] [ENTER]



☞ Either the subtraction key [-] or the negation key [(-)] can be used to obtain a negative sign in an expression.

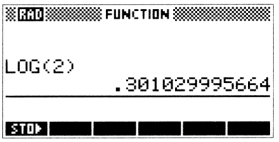
Transcendental functions

Natural exponentials: [SHIFT] e^x 10 [ENTER]

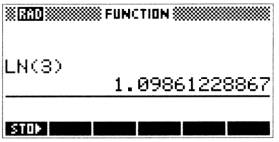


The function keys automatically insert the left parenthesis for you. Unless it is necessary to ensure the intended meaning, you do not need to insert the right parenthesis

Common (base 10) logarithms: [LOG] 2 [)] [ENTER]

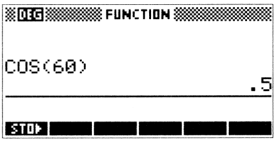


Natural (base *e*) logarithms: [ln] 3 [ENTER]



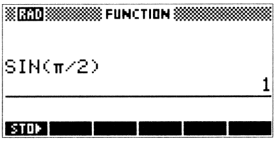
With the angle measure set to `Degrees`:

Trigonometric functions: [COS] 60 [)] [ENTER]

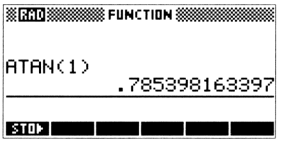


With the angle measure set to `Radians`:

Trigonometric functions: [SIN] [SHIFT] π [÷] 2 [)] [ENTER]



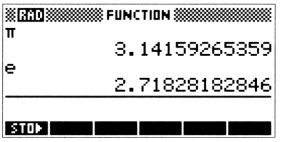
Inverse trigonometric functions: [SHIFT] *ATAN* 1 [)] [ENTER]



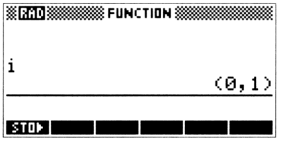
Mathematical constants

π ([SHIFT] π [ENTER])

e ([ALPHA] [SHIFT] e)



i ([ALPHA] [SHIFT] i)



Some for you to try:

g. A famous result. What is $e^{\pi i} + 1$?

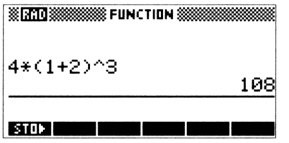
h. Which is larger: e^{π} or π^{e}?

i. What is ln(–1)?

Implied multiplication

The juxtaposition of two number quantities implies multiplication in most cases. Here are some examples to illustrate:

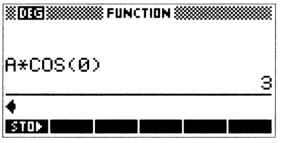
4 [(] 1 [+] 2 [)] [x^y] 3 [ENTER]



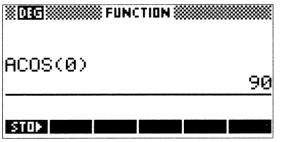
Note that a multiplication symbol is automatically entered for you.

With 3 stored in variable `A` and the angle measure in *MODES* set to `Degrees`:

[ALPHA] A [COS] 0 [)] [ENTER] shows `A*COS(0)`



Note the space that appears on the command line when you press [COS] immediately after typing A. This space appears because there is a chance of ambiguity in the function name. If we were to delete the space between A and COS(0) before pressing [ENTER], we obtain ACOS(θ) not A*COS(θ).



5. Aplets

Aplets are the application environments where you explore different classes of mathematical operations.

Aplets are stored in the Aplet library. Press [APLET] to display the APLET LIBRARY.

Built-in Aplets

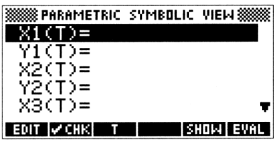
Function	for working with functions, that is, equations of the form $y = f(x)$
Inference	for working with inferential statistics
Parametric	for working with parametric equations: $x(t)$, $y(t)$
Polar	for working with polar equations: $r = f(\theta)$
Sequence	for working with sequences: $\{U_N\}$ $(N = 1, 2, \ldots)$
Solve	for equations of one or more variables
Statistics	for working with descriptive statistics
Quad Explorer	a special e-lesson for investigating the characteristics of quadratic functions
Trig Explorer	a special e-lesson for investigating the characteristics of trigonometric functions

Aplet Library's menu keys

- Press SAVE to save an existing aplet with a new name.
- Press RESET to revert the aplet's default settings.
- Press SORT to sort the Aplet Library menu options alphabetically or chronologically.
- Press SEND to transmit aplet(s) to another HP 39G/40G or PC.
- Press RECV to receive aplet(s) from another HP 39G/40G or PC.
- Press START to activate an aplet.

Starting an Aplet

The following example illustrates how to start a Parametric aplet. The procedure is the identical for all aplets.

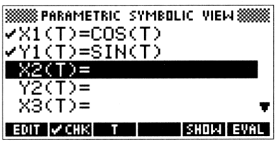


1. Press [APLET].
2. Press [▼] twice to select `Parametric`.
3. Press **START**

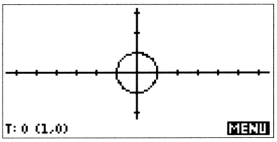
The Function, Parametric, Polar, Sequence, Inference, and Solve aplets start in the Symbolic view. The Symbolic view is used to define functions, equations, and expressions for these aplets. The Statistics aplet starts in the Numeric view and the Trig and Quad Explorer aplets start in the Plot view.

Aplet views

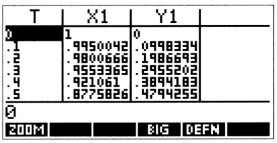
- In Symbolic view ([SYMB]), you specify equations, or data to work on.



- In the Plot view ([PLOT]), you draw, manipulate, and analyze graphs.



- In the Numeric view ([NUM]), you display the coordinates of the plotted points, or enter the data for statistical analysis.



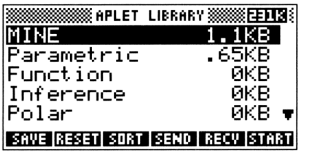
Saving an Aplet

SAVE enables you to save the equations or data you have been using along with the particular settings you specified. You can even save notes ([SHIFT]*NOTE*) and sketches ([SHIFT]*SKETCH*) with the aplet.

When you press **SAVE** you are prompted for a name for the aplet. Enter a name of your choice, press **OK** or if you change your mind, press **CANCEL**.

☞ The A...Z menu key enables you to enter a string of alphabetic characters without holding down the [ALPHA] key. Press A=a to turn this feature off after you have entered a name for the aplet.

For example, if you type in MINE as the name of your aplet and press OK, you will see MINE listed in the Aplet Library along with the built-in aplets.



At any time in the future, you can reuse the equations, data, and settings by pressing [APLET], highlighting MINE and pressing START. If you change the equations, data, or settings, you can either RESET MINE to its original version or SAVE it again with the changes you have made.

Deleting Aplets

To delete a saved aplet, highlight its name in the Aplet Library and press [DEL]. If you want to delete all the saved aplets (except the built-in ones) press [SHIFT] *CLEAR*. The HP 39G/40G will not allow you to delete any of the built-in aplets.

When deleting aplets, you will be prompted to confirm that you want to proceed with the deletion. Press YES or NO.

6. Working with Graphs

These examples illustrate some of the tools available in the Plot view ([PLOT]). All the examples are for Function, but many of the features are similar for Parametric, Polar, Sequence, Solve, and Statistics.

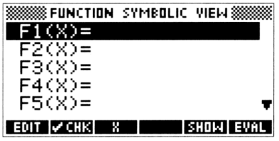
Open the aplet

1. Open the Function aplet.

   [APLET]

   START

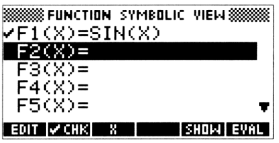
   The Function Symbolic View is the starting view for the Function aplet.



Define the function

2. Enter the function you want to explore.

   [SIN] [X,T,θ] [ENTER]



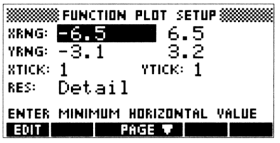
☞ You can enter up to 10 functions, and plot one, some, or all of them. Those functions with a checkmark beside them will be plotted. You press **✔CHK** to add a checkmark, or to remove a checkmark, from a highlighted equation.

Set up the plot

3. Set up the plot.

   [SHIFT] *SETUP-PLOT*

   There are two pages of plot settings, and you move between the two pages by pressing the **PAGE▼** and **PAGE▲** keys. The settings on these pages determine the dimensions and the features of the Plot view or viewing window.



Plot setup fields

The first page of the Function Plot Setup displays the following settings:

`XRNG:` `XMIN` and `XMAX`
the left and right boundaries of your viewing window

`YRNG:` `YMIN` and `YMAX`
the lower and upper boundaries of your viewing window

`XTICK:` the spacing of the marks on the x-axis

`YTICK:` the spacing of the marks on the y-axis

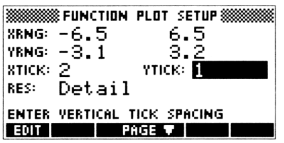
`RES:` plot resolution
(`Detail` for every pixel; `Faster` for every second pixels)

4. Change the `XTICK` setting to 2.

▼ ▼

2

OK



5. Move to the second page of `FUNCTION PLOT SETUP`.

PAGE ▼

Press ✔CHK to check or uncheck any of the following plot mode settings:

`SIMULT` checked for simultaneous graphing of all selected equations; unchecked for sequential (F1(X) before F2(X), and so on).

`CONNECT` checked for connected graphing; uncheck for dot mode

`AXES` checked to show the axes; unchecked to hide the axes

`INV.CROSS` checked for inverted cursor crosshairs (shown as white on a dark background); uncheck for standard cursor crosshairs

`LABELS` checked to have axes labeled with their ranges; uncheck to hide labels

`GRID` checked to have lattice points plotted (points that line up with the tick marks on both axes); uncheck to hide lattice points

Reset all plot settings

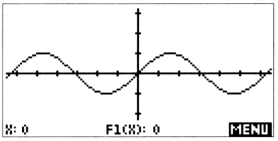
6. Reset all the plot settings so that the origin is at the center of the screen, coordinate axes are shown, each axis tick represents one unit, and each pixel represents 0.1 units.

SHIFT *CLEAR*.

☞ To reset a field to the default value, highlight the field and press DEL.

Plot the function

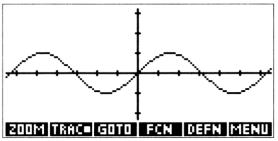
7. Press PLOT to see the graph of the function(s).



Analyze the graph

8. Press MENU and the coordinates disappear to display the Plot view menu keys.

   The Plot view menu keys enable you to explore the graph in greater detail.



Plot view menu keys

- Press ZOOM to display the zoom menu. See "Zooming options" on page 26 for descriptions and examples of zoom options.
- TRACE indicates that the trace function is turned on (this is the default setting). Press ▶ or ◀ to trace along a graph. Press ▲ or ▼ to move from one function to another function. Press TRACE to turn the trace function off. When the trace function is off—indicated when the menu key label reads TRACE—the cursor can move freely across the entire viewing window.
- Press GOTO to specify an X value to jump to on the graph. The coordinates of the point at your chosen X value are displayed near the bottom of the screen.
- Press FCN to display the list of function tools. See "Function tools" on page 27 for more information. Note: The FCN menu key is only available in the Function aplet.
- Press DEFN to display the equation for the currently selected function. In the example above, the equation is `F1(X): SIN(X)`.
- Press MENU to hide the menu labels. Press MENU again to obtain the coordinates. Press MENU once more to show the menu labels again.

☞ When all of the menu labels are hidden, pressing any of the menu keys restores the trace coordinates.

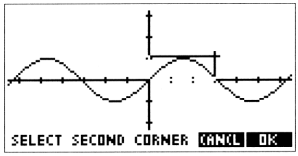
Zooming options

The ZOOM menu key displays the following zoom methods:

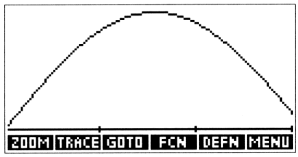
`Center`	centers the screen at the location of the cursor.
`Box...`	allows you to draw a box that will become your new viewing window.
`In`	will *zoom in* by the horizontal and vertical zoom factors.
`Out`	will *zoom out* by the horizontal and vertical zoom factors.
`X-Zoom In`	will *horizontally zoom in* by the zoom factor.
`X-Zoom Out`	will *horizontally zoom out* by the zoom factor.
`Y-Zoom In`	will *vertically zoom in* by the zoom factor.
`Y-Zoom Out`	will *vertically zoom out* by the zoom factor.
`Square`	will *square up* the viewing window so that 1 pixel represents the same distance horizontally and vertically.
`Set Factors...`	allows you to set your own horizontal and vertical zoom factors (default is 4 for both factors).
`Auto Scale`	adjusts the scale of the y-axis so that as much of the graph as possible is displayed while also showing the origin, maximum, and minimum.
`Decimal`	returns a zoomed graph to its default plotting domain.
`Integer`	changes the tickmark spacing on both axes to 1 unit.
`Trig`	changes the tickmark spacing for the independent variable to $\pi/24$ radians, 7.5 degrees or 81/3 grads.
`Un-zoom`	resets the viewing window to its last settings following a zoom.

Example:

1. Graph the sine function once again using the default plot settings.
2. Press MENU
3. Press ZOOM
4. Select `Box...` and press OK.
5. The cursor is at the origin Press OK to make the origin the first corner of the zoom box.



6. Press ▶ to move the cursor to X=3.
7. Press ▲ to move the cursor to Y=1. You'll see a box being drawn.
8. Press OK. The viewing window has changed to encompass the area between [0,0] and [3,1].



Function tools

The menu key labeled FCN in the Function aplet's Plot view brings up a menu list of tools to help you analyze the important characteristics of functions.

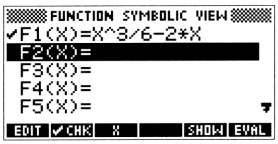
Example:

1. Open the Function aplet and define the function

$$\frac{x^3}{6} - 2x$$

APLET START

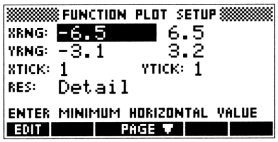
X,T,θ x^y 3 ÷ 6 − 2 X X,T,θ ENTER



2. Reset plot view settings.

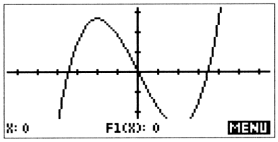
SHIFT *SETUP-PLOT*

SHIFT *CLEAR*



3. Plot the function

PLOT



4. Move the cursor along the graph until it reaches X=3.

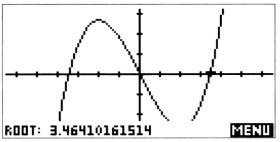
▶ (until `X: 3`)

5. Display the Plot FCN menu.

MENU FCN

Finding roots

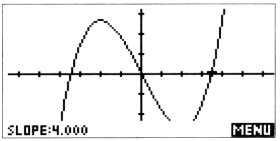
Select `Root` and press OK. The cursor moves to the nearest root. You should see `ROOT: 3.46410161514` at the bottom left of the screen. This value is also recorded in a variable named `Root` that you can access from the HOME screen.



☞ Where a function has more than one root, the root closest to the cursor is returned.

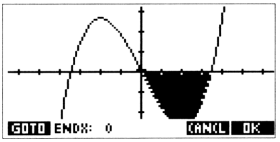
Finding slopes

Press MENU, FCN, select `Slope` and press OK. This calculates the derivative of the function at the x-coordinate of the cursor crosshairs location. You should see `SLOPE: 4.000` at the bottom of the screen. This value is also recorded in a variable named `Slope`.



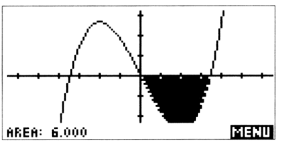
Finding integrals

Press MENU, FCN and select `Signed area...` When you press OK, you are prompted for a *starting point* (lower limit of integration). Press OK and the starting point is `X:3.46410161514`. Now you are prompted for an *end point* (upper limit of integration). Press ◄ to move the cursor crosshairs over to `X:0` and watch as the region between the graph and the x-axis is shaded.



☞ You can also use GOTO. In this case, the area is not be shaded.

Press OK once again to compute the definite integral of the function from the starting point to the end point. You should see `Area:6.000` at the bottom of the screen. This value is also recorded in a variable called `Area`.

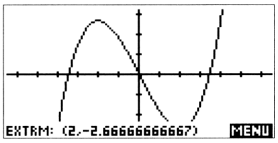


☞ The `Signed area...` option computes a definite integral, so if the function graph lies below the x-axis the resulting area is negative.

☞ To clear the shaded region created by the `Signed area...` option, press PLOT to redraw the function graph.

Finding extrema

Press ▶ to move the cursor is near X = –2.5. Press MENU, FCN, select `Extremum` and press OK. The cursor moves to the nearest extremum and displays its coordinates. You should see `EXTRM: (-2,2.66666666667)` at the bottom of the screen. This value is recorded in a variable named `Extremum`.



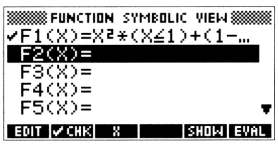
Plotting piece-wise functions

Suppose $f(x) = x^2$ if $x \leq 1$, and $f(x) = 1 - x$ if $x > 1$.

Method 1

1. Start the Function aplet and enter the function.

   APLET *Select* `Function` START
   SHIFT *CLEAR*
   (X,T,θ x²) X (X,T,θ SHIFT *CHARS* ≤ OK 1) + (1 − X,T,θ) X (X,T,θ SHIFT *CHARS* > OK 1) ENTER

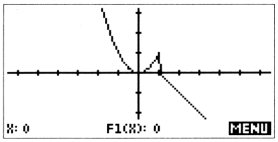


☞ To obtain the inequality symbols, press SHIFT *CHARS* menu, highlight the desired symbol using the arrow keys and press ENTER.

2. Plot the function.

   PLOT

   Note: If the plotting parameters are set so that plotted points will be connected—the default setting—the graph will connect across the jump discontinuity.

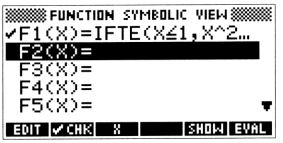


Method 2

An equivalent of the above piece-wise function is IEFE (X≤ 1, X^2, 1-X). This expression can be read as saying "if $x \leq 1$, then evaluate x^2, else evaluate $1-x$."

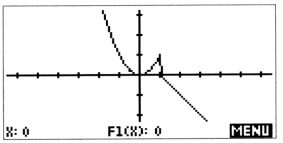
1. Return to the Symbolic view and enter the function.

   SYMB SHIFT *CLEAR*
   ALPHA I F T E (X,T,θ SHIFT *CHARS* ≤ OK 1
   , X,T,θ x^y 2 , 1 - X,T,θ) ENTER



2. Plot the function.

   PLOT

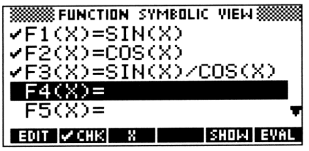


Plotting multiple functions

You can plot up to 10 functions at once.

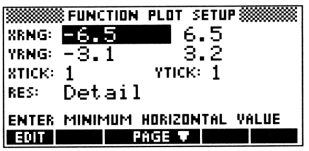
1. Return to the Symbolic view and enter the functions.

   SYMB SHIFT *CLEAR* OK
   SIN X,T,θ ENTER
   COS X,T,θ ENTER
   SIN X,T,θ) ÷ COS X,T,θ) ENTER



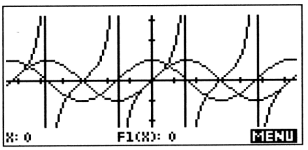
2. Set up the plot.

   SHIFT *SETUP-PLOT*
   SHIFT *CLEAR*



3. Plot the functions

   PLOT



Whether or not these functions are plotted simultaneously or sequentially is determined by whether or not `SIMULT` is checked in the `FUNCTION PLOT SETUP`.

Press ▲ or ▼ to move the cursor from graph to graph.

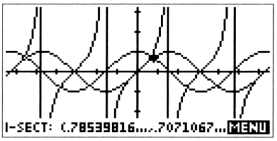
Press DEFN to see the equation of whatever function is currently being traced.

Finding intersections and areas between two graphs

If you have plotted two or more functions, an additional function tool called `Intersection` appears on the **FCN** menu.

Selecting this option uses the function currently selected and prompts you to choose either one additional function or the `X-Axis`.

Pressing **OK** moves the cursor to the nearest intersection point of the two selected graphs (or the nearest root if you choose `X-Axis`), displays its coordinates, and records the coordinates in the variable `Isect`.



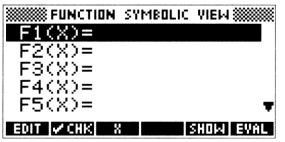
7. Working with Tables

These examples illustrates some of the tools available in the Numeric view ([NUM]). All the examples are for `Function`, but many of the features are similar for `Parametric, Polar, Sequence, Solve,` and `Statistics`.

Open the aplet

1. Open the Function aplet.

   [APLET]
   Highlight `Function`
   START



Define the function

2. Enter these four functions.

   [SIN] [X,T,θ] [ENTER]

   [COS] [X,T,θ] [ENTER]

   [SIN] [X,T,θ] [)] [÷] [COS] [X,T,θ] [)] [ENTER]

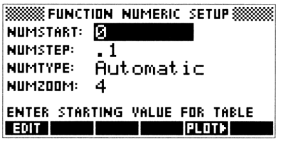
   [COS] [X,T,θ] [)] [÷] [SIN] [X,T,θ] [)] [ENTER]

Set up the table

3. Return the numeric table settings to their default settings (where the starting value is 0 and values are automatically incremented in steps of 0.1).

   [SHIFT] *SETUP-NUM*

   [SHIFT] *CLEAR*



Numeric setup fields

Use the `Numeric Setup` to set up parameters for building a table of values for a function.

`NUMSTART:` the starting value for `X`

`NUMSTEP:` the step value (increment) for `X`

`NUMTYPE:` `Automatic` to let the HP 39G/40G generate values for `X`.
`Build Your Own` to fill in your own values for `X`

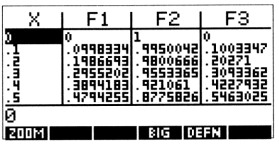
`NUMZOOM:` the zoom factor for your table

Display the table

4. Display the table.

   NUM

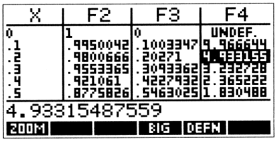
   The ▲, ▼, ►, ◄ keys enable you to move from entry to entry of the table.



5. To find the value of F4(X) when X = 0.2, scroll to the F4 column.

   ▼ ▼ ► ► ► ►

   The full precision of a highlighted entry is displayed at the bottom of the screen.

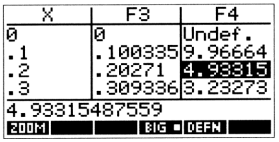


6. Increase the font size in the table.

   BIG

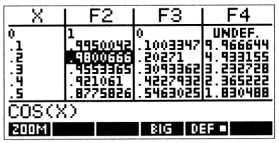
7. Decrease the font size in the table.

   BIG



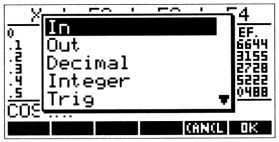
8. Display the equation of F2(X).

   ◄ ◄ DEFN



9. Display the list of zoom methods.

   ZOOM



Zoom options

- `In` will *zoom in* by the zoom factor.
- `Out` will *zoom out* by the zoom factor.
- `Un-zoom` resets the table to its last settings.
- `Decimal` restores the default settings.
- `Integer` sets the starting value `NUMSTART` to 0 and the step size `NUMSTEP` to 1 unit.
- `Trig` sets the starting value `NUMSTART` to 0 and the step size `NUMSTEP` to approximately π/24 units. If the angle measure mode is *degrees*, then the `NUMSTEP` is 7.5 degrees.

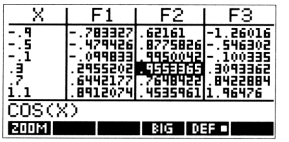
☞ You can change the designated zoom factor by pressing SHIFT *SETUP-NUM* and editing `NUMZOOM`. The default zoom factor is 4.

10. Display the table using the zoom out method.

   ZOOM

   Select `Out`

   OK.



   The table is recomputed so that `.3` is still highlighted, but now the step sizes are `.4` instead of `.1`. That is, the step size is multiplied by the zoom factor. If we had zoomed in instead of zooming out, the step size would have been divided by the zoom factor.

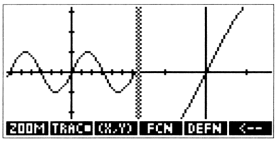
8. Special Views

Press VIEWS to obtain a menu list of special viewing screens.

Split screen—two graphs

`Plot-Detail` splits the screen into two vertical panes and draws a copy of the graph in each pane. It allows you to see a before-and-after view of a graph that you modify in some way.

For example, if you press ZOOM and select a zoom option, the left graph remains unchanged but the right graph is re-plotted according to the zoom option you chose. The example at the right shows two views of the graph of sin(x). In the left pane is the graph plotted according to the default plot setup parameters; in the right is the same graph viewed by zooming in about the origin.

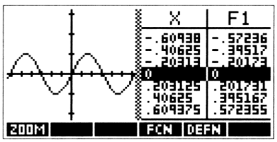


You can trace a graph and see the cursor move in both panes simultaneously.

Press <-- to copy the new graph to the left pane. You can repeat this process as many times as you wish.

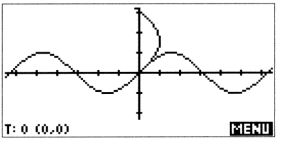
Split screen—graph and table

`Plot-Table` splits the screen into two vertical panes and draws the graph in the left pane and the corresponding table in the right pane. It enables you to see both the `PLOT` and `NUMERIC` views of your function at the same time.



As you move the trace on the graph, the corresponding coordinates are highlighted in the table.

Overlaying one graph on another



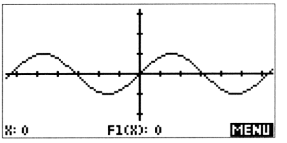
`Overlay Plot` enables you to plot a graph over your last graph without erasing it.

For example, suppose you plot `F1(X)=SIN(X)` in the default window. If you switch from `Function` to `Parametric` in [APLET] you can use `Overlay Plot` (with the same window settings) to overlay the graph of

```
X1(T)=SIN(T)
Y1(T)=T
```

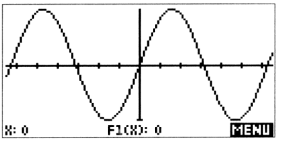
on top of the old graph to show the inverse relation.

Automatic scaling



`Auto Scale` will automatically scale the vertical range so as to fill as much of the screen as possible while still showing the origin, minima, and maxima.

The first example at the right shows the default display of `F1(X)=SIN(X)`. The second example shows the same function after choosing [VIEWS] `Auto Scale`.



Special preset zoom windows

`Decimal` sets the tick marks along the x-axis to be one unit apart (so that each pixel width = 0.1 units). Note that this effectively sets the viewing window back to its default ranges: [–6.5, 6.5] by [–3.1, 3.2] for functions.

`Integer` sets the tick marks along the x-axis to be ten units apart (so that each pixel width = 1 unit).

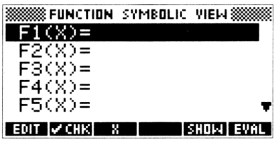
`Trig` sets the tick marks along the x-axis to be approximately $\pi/2$ units apart, and each pixel width is approximately $\pi/24$ units. If the angle measure mode is *degrees*, then `Trig` sets the tick marks along the x-axis to be 90 degrees apart, and each pixel width is 7.5 degrees.

☞ The autoscaling and special preset zoom window views are also available in the ZOOM menu when you are in Plot view.

9. Functions

1. To open the Function aplet, press [APLET]
2. Highlight `Function`.
3. Press **START**.

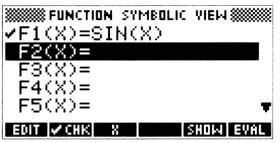
The `FUNCTION SYMBOLIC VIEW` is displayed. On this screen you define the functions that you want to plot.



You can define up to 10 functions: `F1(X)`, `F2(X)...F0(X)`.

Example:

1. With `F1(X)` = highlighted, type [SIN] [X,T,θ] [ENTER].



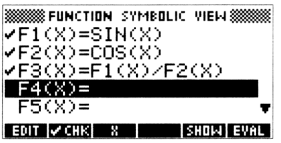
   When `Function` is activated, [X,T,θ] inserts the variable `X` whenever you press it. There is also a ⊞ menu key to assist in entering formulas.

   Note that the closing parenthesis is entered for you.

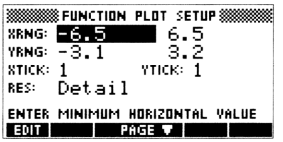
   The ✓ indicates that `F1(X)` is selected for graphing or making a table. An equation or automatically selected on entry.

   The menu keys you have access to while the `FUNCTION SYMBOLIC VIEW` screen is displayed are explained in "Function aplet's symbolic view keys" on page 38.

2. With `F2(X)` = highlighted, type [COS] [X,T,θ] [ENTER].
3. With `F3(X)` = highlighted, type [ALPHA] F1 [(] [X,T,θ] [)] [÷] [ALPHA] F2 [(] [X,T,θ] [)] [ENTER].



4. Once you have defined the functions you want to plot, you can view and, if necessary, change the plot setup parameters.

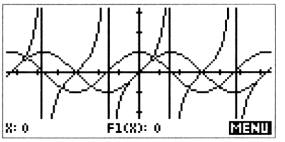


   These parameters determine the plotting range, tickmark spacing, resolution, and so on.

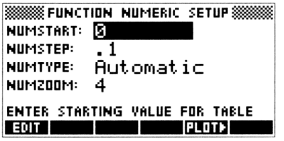
   [SHIFT] *SETUP-PLOT*.

   Note that there are two pages of plot setup parameters. Press **PAGE▼** to display the second page.

5. To plot the functions, press PLOT.

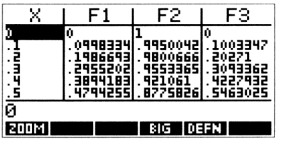


6. To view and, if necessary, change the table setup parameters, press SHIFT *SETUP-NUM*.



These parameters determine the starting value for the independent variable, the increment for consecutive values of the independent variable, whether the calculator or the user determines the values of the independent variable, and the zoom factor for table zooming.

7. To display the table, press NUM.



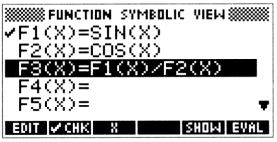
Function aplet's symbolic view keys

- Press EDIT to copy the highlighted function to the edit line.
- Press ✓CHK to select or deselect an equation. A ✓ indicates that the equation is selected. Any or all of the functions can be selected at any time.
- Press X to enter the independent variable. It is another X key for typing convenience.
- Press SHOW to display the highlighted function in standard textbook format.
- Press EVAL to evaluate dependent variables or functions used in the highlighted equation.
- Press OK to enter the edited version.
- Press CANCL to restore the original.

Example:

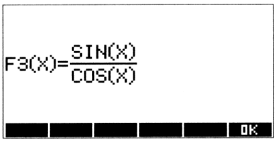
Press SYMB to return to the `FUNCTION SYMBOLIC VIEW` screen.

1. Highlight `F2(X)` and press ✔CHK.
2. Highlight `F3(X)` and press ✔CHK.



3. Highlight `F3(X)=F1(X)/F2(X)` and press EVAL.

4. Press SHOW to see `F3(X)=` as a fraction in vertical form.
5. Press OK to close the SHOW window.



Deleting and clearing functions

Press DEL to delete a highlighted function. Press SHIFT *CLEAR* to delete *all* the functions.

☞ When you press SHIFT *CLEAR*, you are asked if you really want to `Clear All` functions. Press YES or NO.

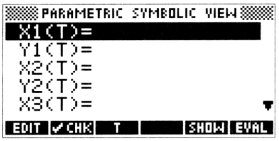
10. Parametric Equations

1. To open the Parametric aplet, press APLET

2. Highlight `Parametric`.

3. Press START.

The `PARAMETRIC SYMBOLIC VIEW` is displayed, listing 10 pairs of parametric equation variables: `X1, Y1, X2, Y2, ..., X9, Y9, X0, Y0`.



Parametric equations are checked in pairs. When you select or deselect one member of the pair, the other member is also automatically selected or deselected.

Example:

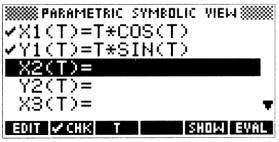
Suppose that you want to explore the following set of parametric equations: $x(t) = t \cos t$ and $y(t) = t \sin t$ for $0 \le t \le 2\pi$.

For the purposes of this example, ensure that the current angle measure mode is Radians.

1. Enter the equations.

   X,T,θ × COS X,T,θ ENTER

   X,T,θ × SIN X,T,θ ENTER

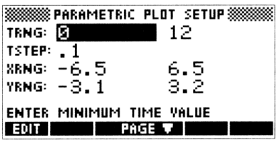


   When `Parametric` is activated, X,T,θ provides the variable `T` whenever you press it. There is also a T menu key to assist with the entry of equations.

   The EDIT, ✔CHK, SHOW, and EVAL menu keys operate in exactly the same way as the menu keys in the Function aplet. See "Function aplet's symbolic view keys" on page 38 for further information.

2. Once you have defined the equations you want to plot, you can view and, if necessary, change the plot setup parameters.

   These parameters determine the plotting range, and the independent variable's range and increment value.



   SHIFT *SETUP-PLOT*.

   Note that there are two pages of plot setup parameters. Press PAGE▼ to display the second page.

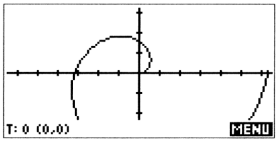
3. Reset all the plot settings.

   SHIFT *CLEAR*.

4. Plot the equations.

   PLOT

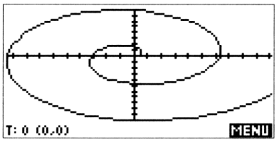
   Both the value of the independent variable `T` and the coordinates `(X1(T),Y1(T))` are shown as you trace the curve. You can trace beyond the original domain in either direction.



5. You can change the scale to see more or less of your graph. In this example, choose Auto Scale. See "Special Views" on page 35 for a description of Auto Scale.

   VIEWS *Select* `Auto Scale` OK

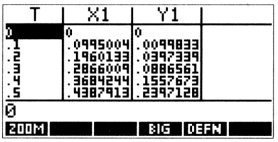
   See "Zooming options" on page 26 for further information on zooming.



6. Display the table of values for `T`, `X1(T)`, and `Y1(T)`.

   NUM

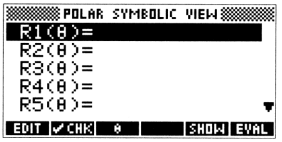
   See "Working with Tables" on page 32 for further information on zooming within a table and tools for analyzing the table.



11. Polar Equations

1. To open the Polar aplet, press [APLET]
2. Highlight `Polar`.
3. Press **START**.

The `POLAR SYMBOLIC VIEW` is displayed, listing the 10 polar equation variables: `R1, R2, R3, ..., R9, R0`.



Example:

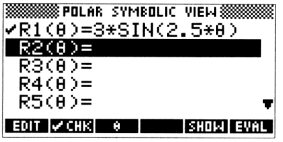
Suppose that you want to explore the equation $r(\theta) = 3 \sin(2.5\,\theta)$ for $0 \leq \theta \leq 4\pi$.

For the purposes of this example, ensure that the current angle measure mode is Radians.

1. Enter the equation.

   3 [x] [SIN] 2.5 [X,T,θ] [ENTER]

   When `Polar` is activated, [X,T,θ] provides the variable θ whenever you press it. There is also a ▫ menu key to assist in the entry of equations.



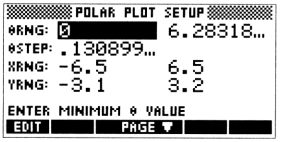
   The **EDIT**, **✔CHK**, **SHOW**, and **EVAL** menu keys operate in exactly the same way as in the Function aplet. See "Function aplet's symbolic view keys" on page 38 for further information.

2. Display the `POLAR PLOT SETUP` screen.

   [SHIFT] *SETUP-PLOT*.

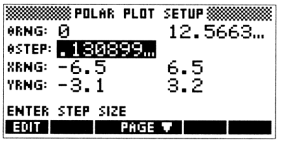
   θRNG is the plotting range of the angle θ.

   θSTEP is the increment size used to determine what values for θ to plot within the plotting range.



3. Change the upper limit of θRNG to 4π.

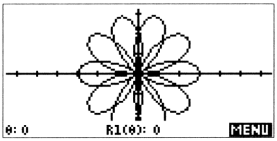
   [▶] 4 [SHIFT] π [ENTER]



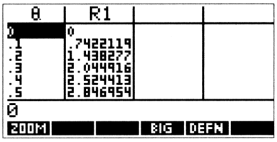
4. Plot the equation

   PLOT.

   The values of θ and `R1(θ)` are shown at the bottom of the screen as you trace the curve.



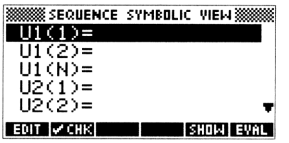
5. Display the table of values for θ and `R1(θ)` by pressing NUM.



12. Sequences

1. To open the Sequence aplet, press [APLET]
2. Highlight `Sequence`.
3. Press **START**.

The `SEQUENCE SYMBOLIC VIEW` is displayed, listing the 10 sequence variables `U1(N), U2(N), U3(N) ...U9(N), U0(N).`



To allow for recursive definitions of sequences, there are also variables for specifying the first one or two terms of a sequence: `U1(N1), U1(2), U2(1), U2(2)...U0(1), U0(2).`

Example:

The simplest kind of sequence is one where the nth term as a function of n. An example is the geometric sequence 1, 1/2, 1/4, 1/8, . . . This can be expressed as:

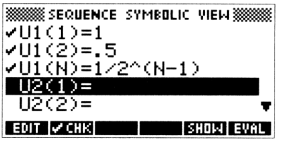
U_N = `1/2^(N-1).`

1. Enter the equation for the sequence against `U1(N)`.

   [▼][▼] *to move to* `U1(N)`

   1 [÷] 2 [x^y] **(N-1)** [ENTER].

   The values for the first two terms `U1(1)` and `U1(2)` are automatically computed and displayed.

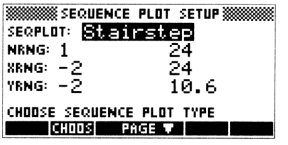
   

   When `Sequence` is activated, [X,T,θ] provides the variable n whenever you press it. The **(N-2)**, **(N-1)**, **N** and **U1** menu keys assist in the entry of sequences.

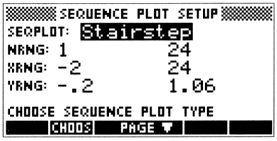
   The **EDIT**, **✔CHK**, **SHOW**, and **EVAL** menu keys operate in exactly the same way as in the Function aplet. See "Function aplet's symbolic view keys" on page 38 for further information.

2. Display the `SEQUENCE PLOT SETUP` screen.

   [SHIFT] *SETUP-PLOT.*



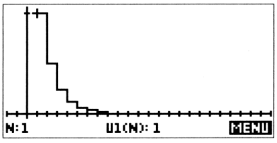
3. Since 1/2^(N–1) $\leq$ 1 for all positive integers, you will see more of the plot if you set the YRNG filed accordingly, such as to [–.2, 1.06].



4. Plot the sequence.

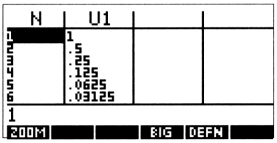
   PLOT

   Both the value of the index `N` and the value of the *Nth* term, `U1(N)`, are shown as you trace the curve



5. Display a table of values for `N` and `U1(N)`.

   NUM

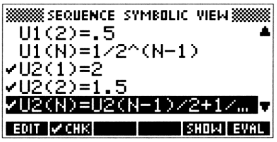


Iterative sequences

You can also define a sequence iteratively.

Example:

A certain sequence derived from Newton's Method can be defined iteratively.



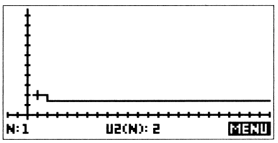
1. Press SYMB and uncheck U1(1), U1(2), or U1(N).
2. Highlight `U2(1)` and enter 2.
3. Highlight `U2(2)` and enter 1.5.
4. Highlight `U2(N)` and enter:

   `U2(N-1)/2+1/U2(N-1)`

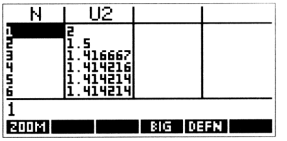
5. Ensure that the plot setup parameters are set to their default values.

   SHIFT *SETUP-PLOT*
   SHIFT *CLEAR*

Press PLOT to plot the sequence.



You can see how quickly this sequence converges to $\sqrt{2}$ by pressing [NUM].

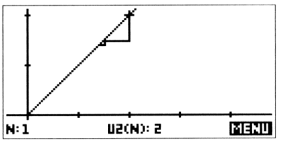


Cobweb plots

Iterative sequences are best displayed using a *cobweb* plot. In a cobweb plot, the first term of a sequence U_1 is located as the point (U_1, U_1) on the line $y = x$. This point is connected with a vertical line segment to (U_1, U_2) which in turn is connected with a horizontal line segment to (U_2, U_2). This process is then continued to form a web of line segments connecting (U_2, U_2) to (U_3, U_3) to (U_4, U_4) and so on. If the sequence converges, one sees the web close in on a particular point.

To see a cobweb plot for the sequence we just defined:

1. Press [SYMB] to return to the `SEQUENCE SYMBOLIC VIEW`.
2. Select `U2` in [SYMB] (and deselect any other sequences defined).
3. Press [SHIFT] *SETUP-PLOT* to bring up the `SEQUENCE PLOT SETUP`.
4. Highlight `SEQPLOT`, **CHOOS** `Cobweb`, and press **OK**.
5. Set the viewing window to [–.4, 4.8] by [–.4, 2.12]
6. Press [PLOT] to see the cobweb plot.



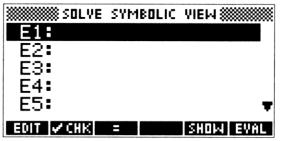
If you trace the cobweb plot near the point of convergence, you can **ZOOM** `In` to see more detail.

13. Solving Equations

The `Solve` aplet enables you to find roots of expressions and solve equations.

1. To open the Solve aplet, press [APLET]
2. Highlight `Solve`.

3. Press **START**.



The `SOLVE SYMBOLIC VIEW` is displayed, listing the 10 equation variables: `E1, E2, E3 ... E9, E0`.

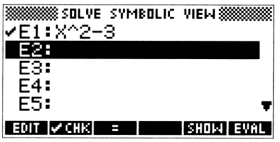
Analyzing an expression in one variable

This example illustrates how to find a root of the expression `X^2-3`.

1. Enter the equation.

   [X,T,θ] [x^y] 2 [-] 3 [ENTER]

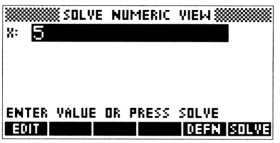
   When `Solve` is activated, [X,T,θ] provides the variable `X` whenever you press it. However, you can use any real variables you wish in your equations.



   The **EDIT**, **✔CHK**, **SHOW**, and **EVAL** menu keys operate in exactly the same way as in the Function aplet. See "Function aplet's symbolic view keys" on page 38 for further information.

2. Display the `SOLVE NUMERIC VIEW` screen and specify a value for `X` (in this case, 5) to act as an initial seed value.

   [NUM]
   5 [ENTER]

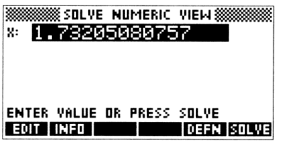


3. Solve for the unknown variable.

   SOLVE

   The root closest to the seed value is returned.

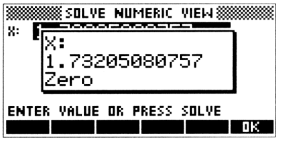
   Different roots may be found by changing the seed value.



Solve aplet's numeric view menu keys

- Press EDIT to edit the current value of the highlighted variable
- Press INFO to display a message about the solution (see below).
- Press DEFN to display the symbolic definition of the current expression.
- Press SOLVE to find a solution for the highlighted variable, based on the values of the other variables.

The following is a brief description of INFO messages:



`Zero` indicates that the displayed value `X` is a root (making `E1:X^2-3` equal to 0) to 12 digits of precision.

`Sign Reversal` indicates that the value of the expression changes sign (from positive to negative or vice-versa) by a change in the last digit of the displayed solution of `X`. (Note: if the expression is the formula for a continuous function, the displayed value is within one digit of a root.)

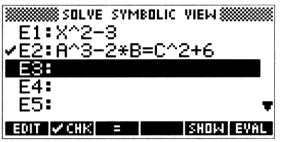
`Extremum` generally indicates that the displayed value `X` minimizes the absolute value of the expression, but no sign reversal is obtained.

☞ When you return to the HOME screen after using the `Solve` aplet, any variables used will have their last values shown in the `SOLVE NUMERIC VIEW`.

Analyzing an equation with several variables

An equation can have any number of variables. Providing that you know the values of all the other variables, you can use the Solve aplet to solve the value of a specified variable. For example, if $a^3 - 2b = c^2 + 6$, you can solve for b if you know the values of a and c.

1. Return to the `SOLVE SYMBOLIC VIEW` and enter the equation.



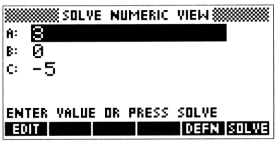
SYMB

▼ to highlight `E2:`

ALPHA A x^y 3 - 2 × ALPHA B =
ALPHA C x^y 2 + 6 ENTER

Note: `E1:` *has been automatically deselected. This is because only one equation can be checked at a time in the Solve aplet.*

2. Enter the known variables in the Numeric view.



[NUM]

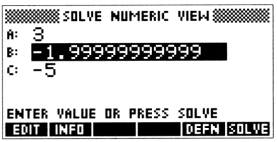
3 [ENTER]

[▼]

[(-)] 5 [ENTER]

3. Solve for the variable B.

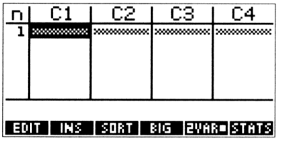
[▼] to highlight B:
SOLVE



14. Statistics

The Statistics aplet can store up to ten separate data sets. It can do one-variable or two-variable statistical analysis of one or more sets of data.

To start Statistics, press APLET, select `Statistics`, and press **START**. The Statistics aplet starts in Numeric view, which is used to enter data. Each column represents a variable named C1 to C9 and C0.



After entering the data, you must define the data set in the Symbolic view (SYMB).

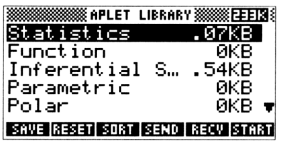
The values computed in the Statistics aplet are saved in variables, and many of these variables are listed by the **STATS** function accessible from the Statistics aplet's Numeric view screen.

Example: one-variable statistics

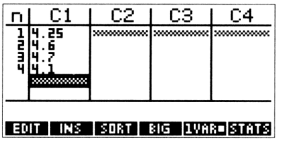
Suppose that a manufacturing company purchases a certain part four times a year. In the last year, the price and the number of units ordered each time was \$4.25 (250 units), \$4.60 (800 units), \$4.70 (900 units), and \$4.10 (1,000 units).

1. Open the Statistics aplet.

   APLET *Select* `Statistics`
   RESET **YES**
   START

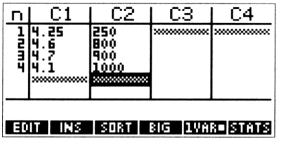


2. Enter the prices paid in column 1.
   4.25 ENTER
   4.60 ENTER
   4.70 ENTER
   4.10 ENTER



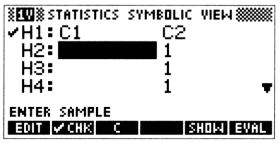
3. Enter the corresponding frequencies (that is, number of parts purchased) in column C2.

   ▶ 250 ENTER
   800 ENTER
   900 ENTER
   1000 ENTER



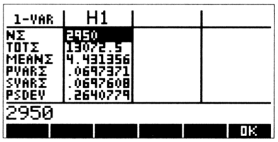
4. Ensure the **1VAR**/**2VAR** menu key label reads **1VAR**.

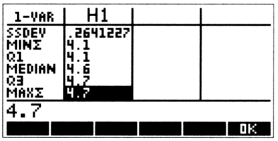
5. Press [SYMB]. The STATISTICS SYMBOLIC VIEW screen is where you specify what column holds the data to be analyzed. You can also specify the corresponding frequencies. The default frequency value is 1. You can overwrite this value with a new number if the frequency for each data point is the same. If the frequency of each data point is not the same, you need to specify a frequencies column. In our example, the data to be analyzed is in column C1 and the corresponding frequency data is stored in column C2.



[▶] **C** 2 **OK**

6. To compute statistics about the prices, return to the numeric view ([NUM]) and press **STATS**. There are two pages of statistics. Press [▼] several times to scroll to the second page.



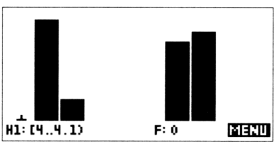


7. To plot a histogram of your data you will need to change the plot setup parameters so that all your data will be plotted.

OK [SHIFT] *SETUP-PLOT*
[▶] [.] 1 **OK**
4 **OK** 5 **OK**
[(-)] 100 **OK** 1100 **OK**
4 **OK** 5 **OK**

8. Plot a histogram of the data.

[PLOT]

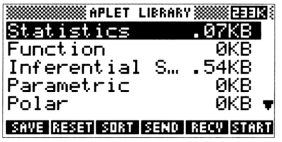


Example: two-variable statistics

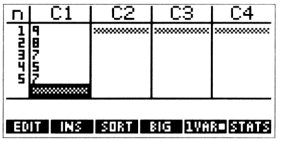
Suppose you want to explore the relationship between the temperature of a object and its volume.

1. Open the Statistics aplet.

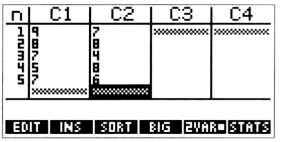
   APLET *Select* Statistics
   RESET YES
   START



2. Enter the temperatures in column C1.
   9 ENTER
   8 ENTER
   7 ENTER
   5 ENTER
   7 ENTER

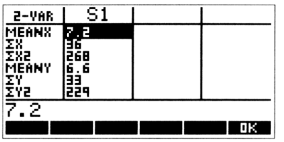


3. Move the cursor to column C2 and enter the the corresponding volumes.
   ▶ 7 ENTER
   8 ENTER
   4 ENTER
   8 ENTER
   6 ENTER



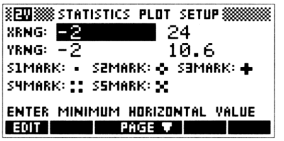
4. Ensure the 1VAR/2VAR menu key label reads 2VAR.

5. To compute statistics about your data, press STATS.



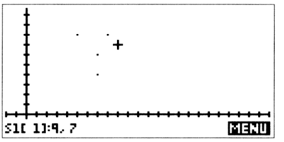
6. To view and, if necessary, change the parameters for plotting a scatter plot of your data

   OK SHIFT *SETUP-PLOT*

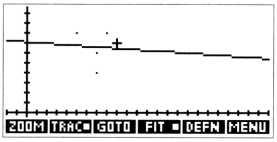


7. Draw a scatter plot of the data.

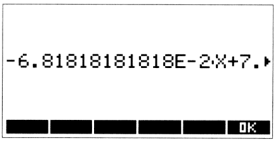
   PLOT



8. To draw a regression line:
MENU FIT



9. To see the equation of the regression line:
SYMB ▼ SHOW



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