hp calculators

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Calculations involving plots

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Plotting on the HP 48GII

The HP 48GII calculator provides a host of plots to allow the user to visualize data or relationships between them. The BLUE shifted functions of the top row of keys on the HP 48GII allow access to many of the input forms where plotting specifications may be entered.

The 2D/3D (PLOT SETUP) Form

The 2D/3D (PLOT SETUP) Form is accessed from the LEFT shifted function of the F4 key by pressing and holding down ↰ and then pressing F4 , to access 2D/3D . When pressed, a form is displayed with a number of choices related to plotting.

Figure 1

The first choice deals with choosing the plot type. The selections for plot type are displayed by pressing F2 , which has the label CHOOS right above it. The plot types include plotting functions, polar plots, parametric plots, differential equation plots, conic plots, truth plots, histograms, bar charts, scatter charts, slopefield charts, fast 3D charts, wireframe plots, Ps-contour plots, Y-slice plots, gridmap plots, and Pr-surface plots. A CHOOSE Box appears as shown below.

Figure 2

The Plot Setup form also allows the user to specify the equation being plotted if the cursor is placed on the EQ: field and the EDIT menu label is pressed – this invokes the EquationWriter to allow for the construction of the equation to be plotted. The form also allows the angle measure used and the independent variable to be specified (note: the default is often 'X', but for parametric plots, this will be changed to 't'). In addition, several check boxes that are used to indicate whether the plotted points should be automatically connected together by the calculator and the horizontal and vertical tick marks used for the graph. The form also allows for the plotting of more than one function at a time.

The WIN Form

The WIN form allows for the plot window specifications to be entered and changed. The lower and upper horizontal and vertical values displayed on the graph can be changed. The lower and upper value for the independent variable can also be specified on this form. To open the WIN form, press and hold down ↰ and press F2 , which is WIN . The following form appears:

Figure 3

The menu label ERASE will discard the results of a previous plot and the menu label DRAW will begin the plot.

Calculations involving plots

Once a plot has been made, several options are displayed as menu labels at the bottom of the screen as shown below.

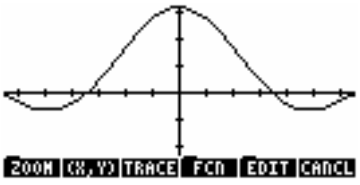

Figure 4

ZOOM provides access to a submenu containing functions allowing different areas of the graph to be examined more closely or less closely. (X,Y) displays the (X,Y) coordinates of the cursor's position. TRACE allows the cursor to be moved along the graph using the ◄ and ► arrow keys. FCN provides access to a submenu allowing for the calculation of various values relating to the graph. EDIT provides access to a submenu allowing for dots, lines, circles, labels and other items to be added to the graph. CANCL returns control to Plot Window from which the graph was created. When FCN is pressed, the menu labels at the bottom of the screen change to those shown in Figure 5 below.

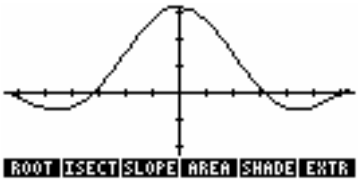

Figure 5

ROOT will find and display a value where the function crosses the X axis. ISECT will determine where two curves or lines intersect or if only one function is plotted, it will determine where the function crosses the X axis. SLOPE will determine the slope of the function at the point indicated by the X position of the cursor. AREA places a marker on the graph and expects the user to move the cursor using the ◄ and ► arrow keys to a second point, where AREA should be pressed again, when the calculator will then calculate the area under the function between the two points. SHADE works like AREA but will shade the area under the function between the two indicated points. EXTR will determine the highest point of the function on the graph. Pressing NXT will display the second set of menu labels as indicated in Figure 6 below.

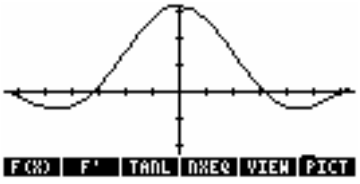

Figure 6

F(X) provides the value of the function at the cursor's X position. F' plots the function's derivative curve along with the original function. TANL will determine the equation of the line tangent to the function at the point indicated by the cursor's X value and plot it along with the original equation. INTEG displays for a few seconds the name of the function being plotted. VIEW displays for a few seconds the equation of the function being plotted. PICT returns you to the previous plotting menu labels.

Examples of calculations involving plots

Example 1: Plot $Y = X^2 - 4$ from X = -3 to +3. Display values of Y from –6 to +6. Find the slope at X = -2, 0, and 2

Solution: ◄ 2D/3D ZOOM ► ▲ ENTER (do not forget to press AND hold the ◄ key while pressing the 2D/3D key)
▼ EDIT ► CLEAR X Y^x 2 ► — 4 ENTER X ENTER

Figure 7

ENTER ← WIN 6 +/- ENTER 6 ENTER 6 +/- ENTER 6 ENTER 3 +/- ENTER 3 ENTER

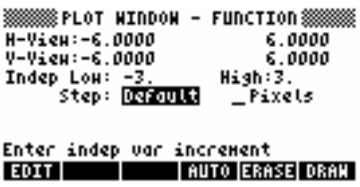

Figure 8

ERASE DRAW

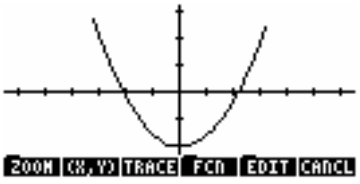

Figure 9

FCN ROOT (the cursor moves to the +2 root)
+/- (recovers the menu labels at the bottom of the screen) SLOPE

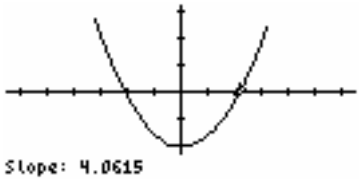

Figure 10

+/- (recovers the menu labels at the bottom of the screen) EXTR

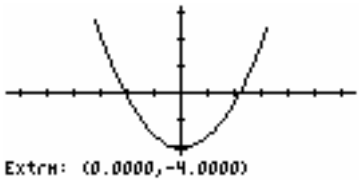

Figure 11

+/- (recovers the menu labels at the bottom of the screen) SLOPE

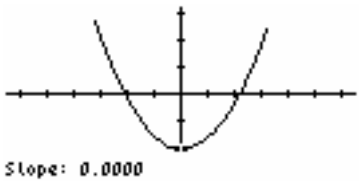

Figure 12

+/- (recovers the menu labels at the bottom of the screen) Move the cursor using the ◀ key until it is to the left of the curve intersecting the x-axis. (Individual presses of the ◀ key may take more than 45 presses - press and hold the ◀ key and it will move faster than this). ROOT +/- SLOPE

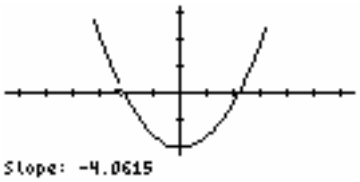

Figure 13

Answer: The slope at –2 is –4.06, the slope at 0 is 0, and the slope at +2 is +4.06. To get out of the Plot Environment press CANCEL. Note that each calculation is copied to the stack. To clear these values, press ↱ CLEAR.

Example 2: Plot the equation Y = SIN(X)/X from –2π to +2π. Assume Radians angle mode. Find the area under the curve from X = 0 to the first positive root greater than zero.

Solution: ↰ 2D/3D MODE ↱ ▲ ENTER (do not forget to press AND hold the ↰ key while pressing the 2D/3D key)
▼ EDIT ↱ CLEAR SIN X ÷ X ENTER X ENTER

Figure 14

ENTER ↰ WIN 6 +/– ENTER 6 ENTER 1 +/– ENTER 1 ENTER 2 SPC ↰ π ___ × +/–
↱ →NUM ENTER 2 SPC ↰ π ___ × +/– ↱ →NUM ENTER

Figure 15

ERASE DRAW

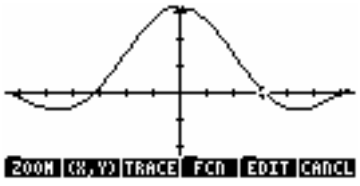

Figure 16

FCN ∫dx

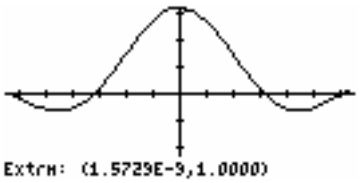

Figure 17

+/– ∫dx (Note the cursor changes at the top of the curve) EDIT

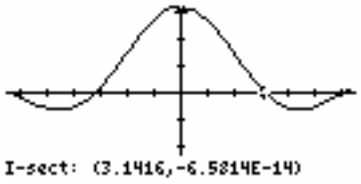

Figure 18

(The first positive root greater than zero is π) [+/-] [NEXT]

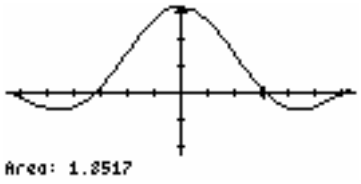

Figure 19

Answer: The area is approximately 1.8517. To get out of the Plot Environment press [+/-] [CANCEL].