



hp calculators

HP 50g Working with Polar Plots

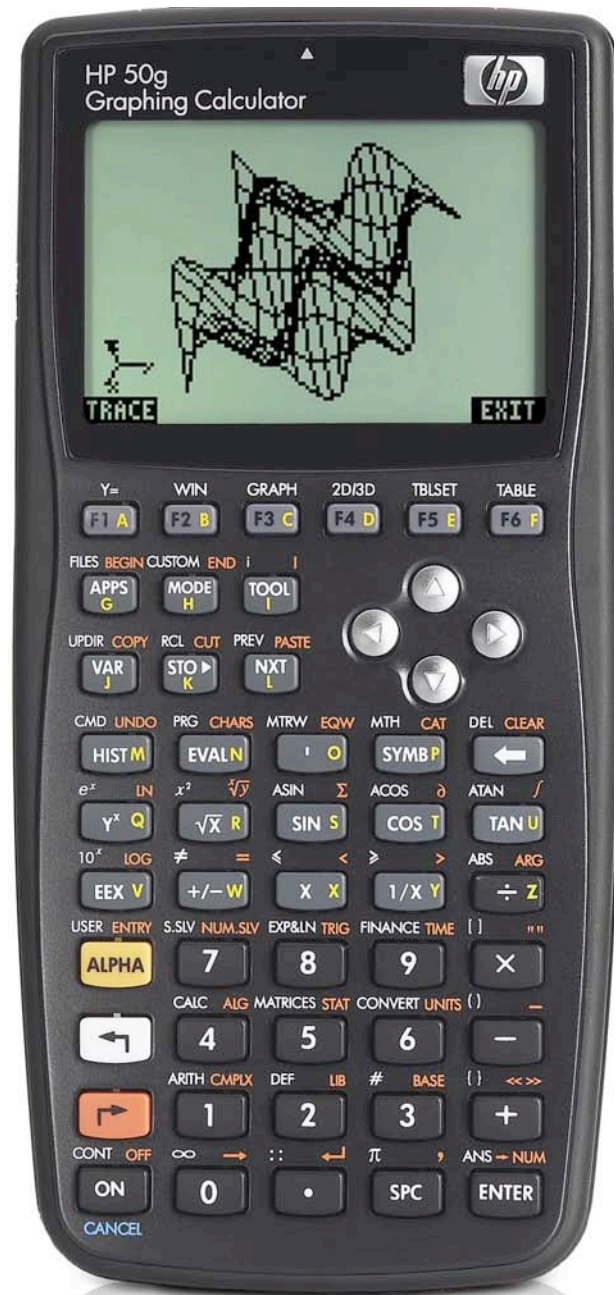
Plotting on the HP 50g

The 2D/3D (PLOT SETUP) Form

The Y= Form

The WIN Form

Examples of polar plots



Plotting on the HP 50g

The HP 50g calculator provides a host of plots to allow the user to visualize data or relationships between them. The WHITE shifted functions of the top row of keys on the HP 50g 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 \leftarrow and then pressing $F4$, to access $\overline{2D/3D}$. When pressed, a form is displayed with a number of choices related to plotting.

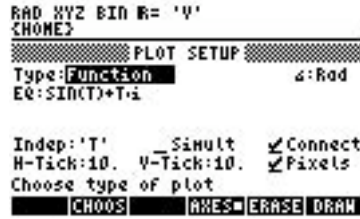


Figure 1

The first choice deals with choosing the plot type. The selections for plot type are displayed by pressing $F2$, which has the label \overline{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.

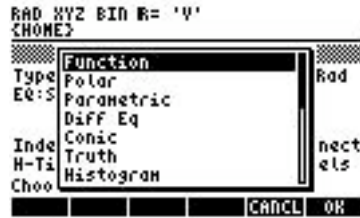


Figure 2

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 \overline{EQWR} 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 polar plots, this will be changed to θ (theta)). 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 Y= Form

The Y= form provides another way to enter your equation or function to plot. Press and **hold** down \leftarrow and then press $F1$, which is $\overline{Y=}$. The following form appears:



Figure 3

Press $F2$, with label \overline{EQWR} above it, to add a function using the equation writer.

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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 \leftarrow and press $F2$, which is \underline{WIN} . The following form appears:

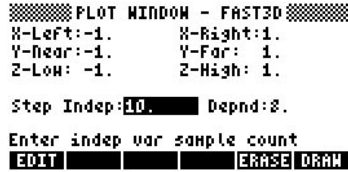


Figure 4

The menu label $\left[\text{FAST3D} \right]$ will discard the results of a previous plot and the menu label $\left[\text{DRAW} \right]$ will begin the plot.

Examples of Polar Plotting

Example 1: Plot the equation below as a polar plot.



Figure 5

Solution: \leftarrow $\underline{2D/3D}$ $\left[\text{FAST3D} \right]$ \rightarrow \uparrow \downarrow $\left[\text{ENTER} \right]$ (do not forget to press AND hold the \leftarrow key while pressing the $\underline{2D/3D}$ key)

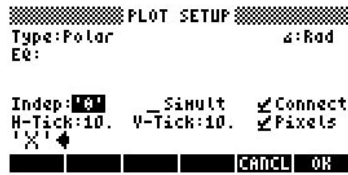


Figure 6

\downarrow \downarrow $\left[\text{FAST3D} \right]$ \leftarrow \leftarrow $\left[\text{ALPHA} \right]$ \rightarrow $\left[\text{T} \right]$ $\left[\text{FAST3D} \right]$ (this sets the independent variable to theta for a polar plot)

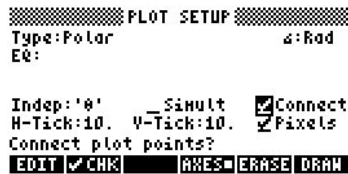


Figure 7

\leftarrow $\underline{Y=}$ $\left[\text{FAST3D} \right]$ $\left[3 \right]$ \div \sqrt{x} $\left[\text{COS} \right]$ $\left[\text{ALPHA} \right]$ \rightarrow $\left[\text{T} \right]$ \uparrow \uparrow

$$R1(\theta) = \frac{3}{\sqrt{\cos(\theta)^2}}$$



Figure 8

$\left[\text{Y}^x \right]$ $\left[2 \right]$ \uparrow \uparrow $\left[+ \right]$ $\left[2 \right]$ $\left[\text{SIN} \right]$ $\left[\text{ALPHA} \right]$ \rightarrow $\left[\text{T} \right]$ \uparrow \uparrow $\left[\text{Y}^x \right]$ $\left[2 \right]$ $\left[\text{ENTER} \right]$

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Figure 9

ERASE DRAW

Answer: The polar plot is displayed. . An ellipse will be drawn.

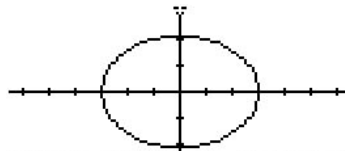


Figure 10

To get out of the Plot Environment press **EXIT**.

Example 2: Plot the equation below as a polar plot.

Solution: **← 2D/3D** **MODE** **→** **▲** **▼** **ENTER** (do not forget to press AND hold the **←** key while pressing the **2D/3D** key)

$$R1(\theta) = 2 \cdot \cos(4 \cdot \theta)$$



Figure 11

▼ **▼** **MODE** **←** **←** **ALPHA** **→** **TI** **MODE** (this sets the independent variable to theta for a polar plot)
← **Y=** **MODE** **2** **COS** **4** **ALPHA** **→** **TI** **ENTER**



Figure 12

ERASE DRAW

Answer: The polar plot is displayed.

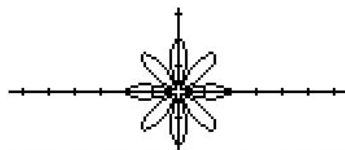


Figure 13

To get out of the Plot Environment press **EXIT**.

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Example 3: Plot the equation below as a polar plot.

$$R2(\theta)=2(1-\sin(\theta))$$



Figure 14

Solution:

\leftarrow 2D/3D \rightarrow \uparrow \downarrow ENTER (do not forget to press AND hold the \leftarrow key while pressing the 2D/3D key)
 \downarrow \downarrow \leftarrow \leftarrow ALPHA \rightarrow π \rightarrow (this sets the independent variable to theta for a polar plot)
 \leftarrow Y= \rightarrow 2 \leftarrow () \rightarrow / \rightarrow - \rightarrow SIN ALPHA \rightarrow π ENTER



Figure 15

\leftarrow WIN 8 +/- ENTER 8 ENTER 6 +/- ENTER 6 ENTER 0 ENTER 2 \leftarrow π \times \rightarrow \rightarrow NUM

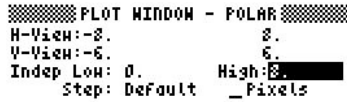


Figure 16

\rightarrow \rightarrow NUM

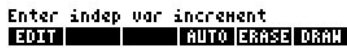


Figure 17



Answer: The polar plot is displayed. This shape is called a cardioid.

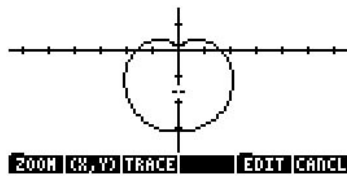


Figure 18

To get out of the Plot Environment press \leftarrow .