







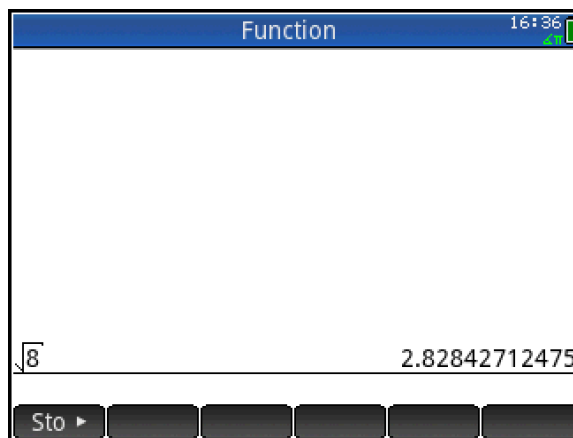
HP Prime: A Breakthrough in Mathematics Education Technology!

GT Springer, Solutions Architect
 HP Calculators and Educational Software
gt.springer@hp.com




This hands-on workshop is a basic introduction to the HP Prime graphing calculator and its classroom wireless network via a series of 10 Quickies.

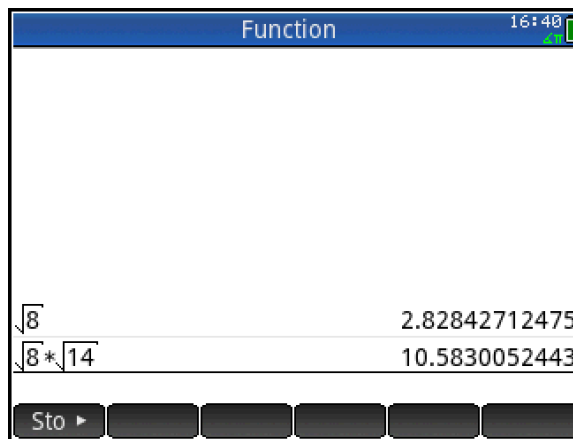
Quickie #1: Home view





1. Press  to turn on your HP Prime
2. Press  to see the Home view.
3. Press     to evaluate $\sqrt{8}$.

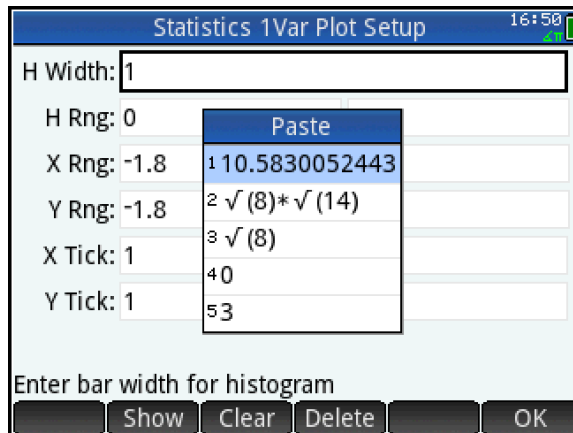


4. Now double-tap $\sqrt{8}$ in the Home history to copy it back to the command line. Yes, HP Prime has a touchscreen!
5. Now we will multiply $\sqrt{8} \cdot \sqrt{14}$.

Type      .

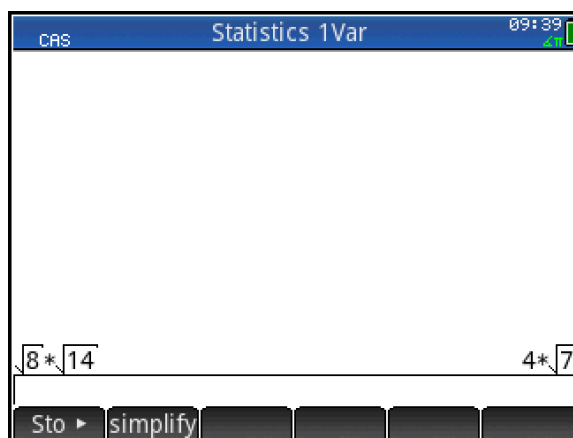


6. Tap on the last result to select it and press   (Copy). You just copied the 10.583... to the Prime clipboard. Now you can paste it anywhere by pressing   (Paste). You can see the clipboard also contains our last few entries.



Quickie #2: CAS view

1. Press **CAS Settings** to open CAS view.
2. Press **Shift** **Menu Paste** to open the clipboard. Tap on the entry $\sqrt{8} \cdot \sqrt{14}$ to paste it into the CAS command line and press **Enter** to see the result.



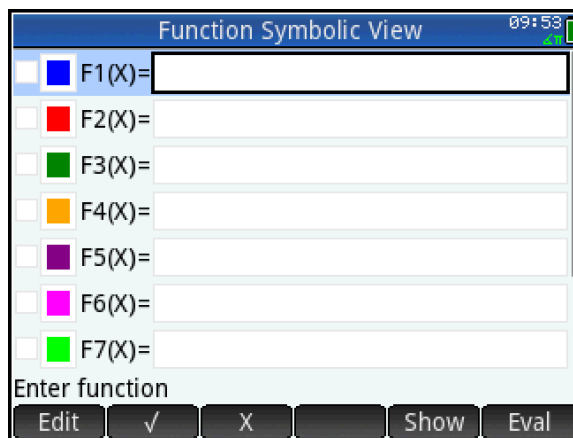
Home view returns numerical approximations while CAS always tries to return exact or symbolic results. It's up to you which view to use.


In either Home or CAS views, you can double-tap an entry or result in history to copy it back to the command line. You can drag or swipe to scroll the history. Tap an entry and press **Del** to delete it or press **Shift** **Esc** (Clear) to clear the entire history.

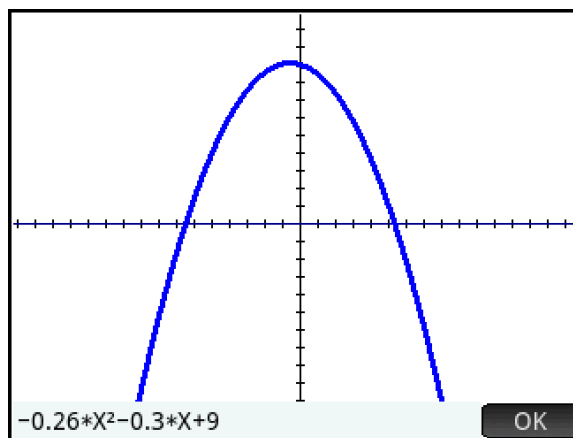
Quickie #3: The Function App

HP Prime uses an app-based architecture to reduce complexity. All HP Prime apps have a similar structure, utilizing the **Symb** **Setup**, **Plot** **Setup**, and **Num** **Setup** keys to maintain simplicity and enhance learnability. These keys open the Symbolic, Plot, and Numeric views that correspond to the symbolic, graphic, and numeric forms of mathematical representations.



1. Press **Apps Info** and tap on the Function app icon. The app opens in Symbolic view. Press **Symb** **Setup** to return to this view at any time. Here you can enter functions and choose a color for plotting each function.



- Press **Plot**  to open Plot view. You will see a message that there are no functions to plot; just tap **OK** to continue.
- Tap **Menu** to open the Plot view menu. Tap **Sketch..** and sketch a parabolic function with your finger, as in the figure to the right.




The function expression is shown at the bottom left. If you like the curve you sketched, tap **OK** to keep it; the expression will be saved in Symbolic view. Otherwise, just sketch a new function to replace it. Tap **OK** when you are done sketching.

In Plot view, you can drag to pan the window or pinch to zoom in and out. You can also press **+**  and **-**  to zoom in and out on the cursor. You can pinch just vertically or horizontally to zoom in one dimension as well. Try it now to get used to how easy it is.

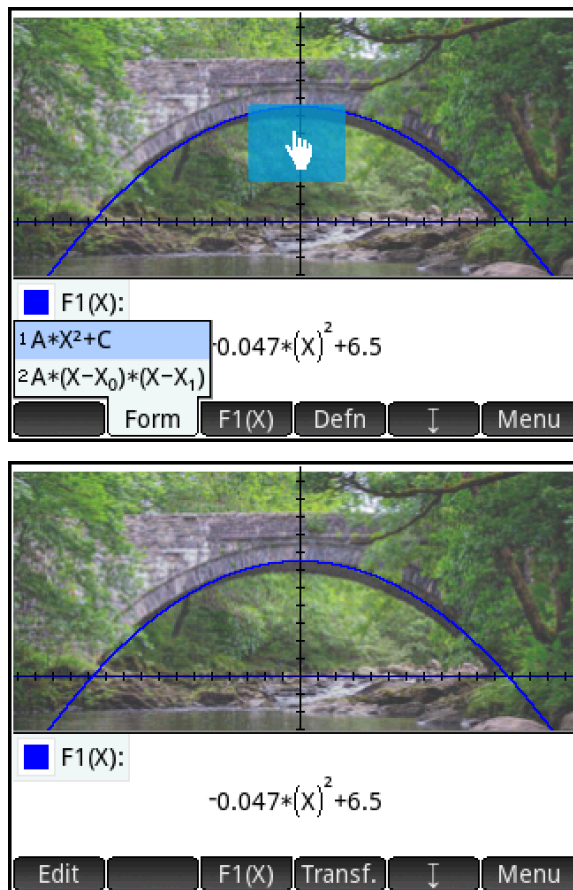
Quickie #4: Image as Background

This Quickie picks up where #3 ended.

- Press **Shift**  to open Plot Setup. Here you can define the Plot view window precisely instead of pinching or dragging in Plot view. Tap the page-down menu key twice to advance to Page 3 of Plot Setup. Tap the first field and select **Best Fit**. Set the **Opacity** to 75. Swipe the image chooser until you see the image named *Stream.jpg*.



2. Press **Plot** to see the image as a background in Plot view. Tap **Menu**, then tap **Fcn** and select **Transform**. You can now drag horizontally or vertically to translate your curve. You can also pinch vertically or horizontally to dilate your curve.
3. Tap **Form**. You can choose multiple forms for your parabolic expression.
4. Tap **Defn**. You can now edit the expression directly to get exactly the expression you want.
5. Tap **↓** to close the editor.



Many of the HP Prime apps have images built-in for you to explore. You can also import your own images using HP Connectivity Kit software.

Quickie #5: Table-zooming

1. Press **Num** to open Numeric view. We know there is a root near $X=11.7$. Enter 11 to jump the table to that X-value.
2. Select the x-value whose y-value is closest to zero. Press **+** to zoom in on that row of the table.
3. Repeat Step 2.

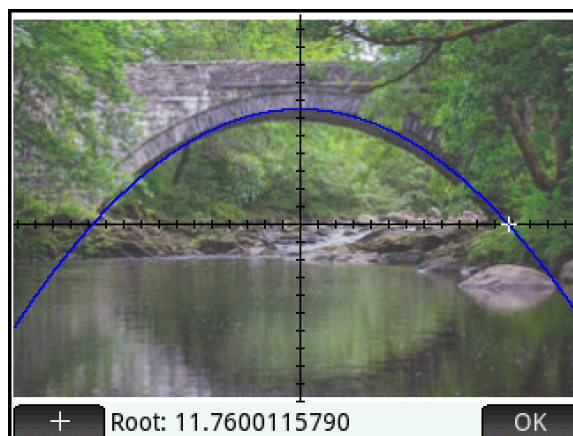
In the figure to the right, 11.76001 is our best approximation to the root so far.

Function Numeric View	
X	F1
11.75962	0.0004338103
11.75967	0.00037983541
11.75972	0.00032586014
11.75977	0.00027188482
11.75981	0.00021790922
11.75986	0.00016393344
11.75991	0.00010995741
11.75996	0.00005598106
11.76001	0.00000200462
11.76006	-0.00005197211
0.00000200462	

Quickie #6: The FCN Menu

Of course, there is a Root command that will find the root directly.

1. Press to return to Plot view. Tap near the root at $X=11.76001$, as in the figure to the right. Tap , then tap and choose **Root**. The value of the root is displayed. Tap when you are done.



The FCN menu also contains options to find intersections and extrema. Finally, you can calculate signed area, report the slope of a function at the trace point or draw the tangent to the function at the trace point.

Quickie #7: CAS, step-by-step




1. Press to open CAS view. We will use CAS to find the root. Begin by entering $F1(x)=0$:

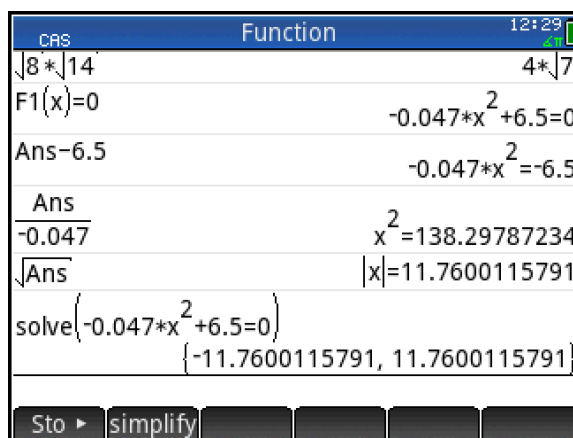
2. Now solve just as you would using pencil and paper. First, subtract 6.5 from both sides:

Next, divide both sides by -0.047:

Finally, take the square root of both sides:

Of course, you can solve the equation directly.





- Press  to open the Toolbox menus. Tap , tap **Solve** and select **Solve**.
- Double-tap the equation in history to paste it between the parentheses. Press  to see the result.

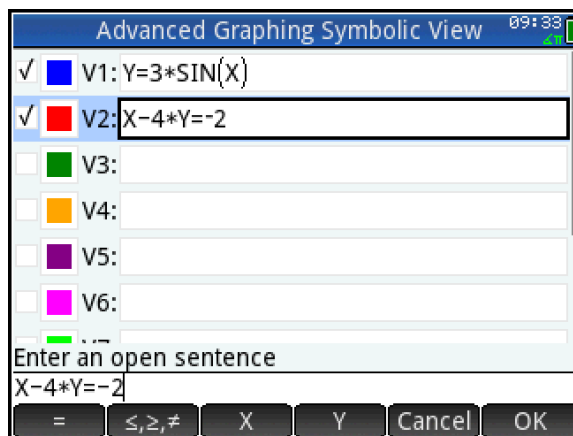



With CAS, the choice is yours. You can work step-by-step or all-at-once.

Quickie #8: The Advanced Graphing App

The Advanced Graphing App uses new graphing methods that support graphing non-functions, inequalities, and more. In this quickie, we look at the intersections of two graphs.


- Press  and tap on the Advanced Graphing app icon. The app opens in Symbolic view. Enter the two equations as shown in the figure to the right. Use , , and  as typing aids. Note that the linear equation is in standard form. You do not have to solve for Y with the Advanced Graphing app!

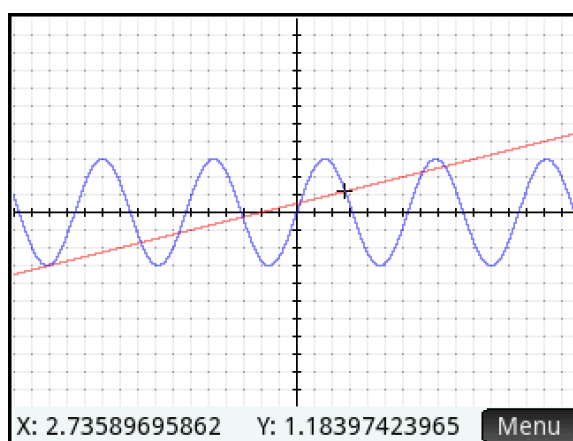
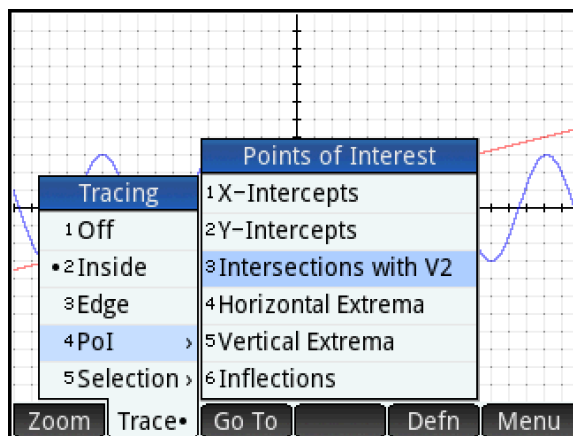


- Press **Plot**  to see the graphs. As you can see, there are multiple intersections. Tap **Menu** and then tap **Trace**. From the menu, select **PoI** (Points of Interest) and tap **Intersections with V2**.

We have now trained the tracer to move among the intersections. Note that you can train the tracer to move among other points of interest as well, including x- and y-intercepts, extrema, or points of inflection.

- Tap near any of the intersections and the tracer will report its coordinates.

- Press **Num**  to open Numeric view. Tap **Trace** and again select **PoI** (Points of Interest) and tap **Intersections with V2**. Now you can see the entire collection of intersections in a table. There appear to be only 7. That first point looked like a point of tangency, but it is not.



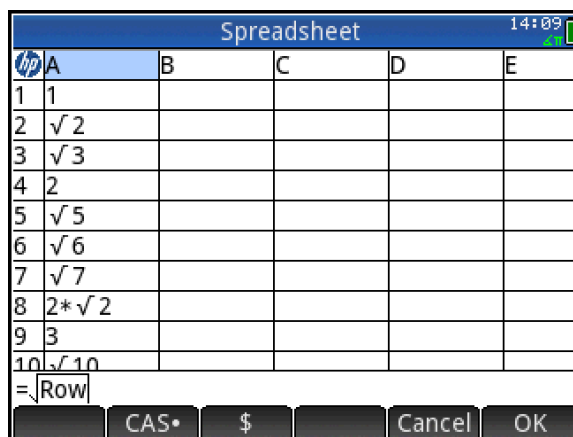
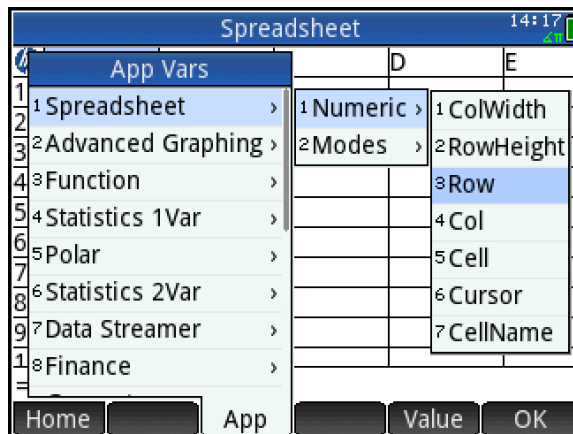
Advanced Graphing Numeric View 09:45	
X	Y
-8.82027162318	-1.7050679058
-6.6841967329	-1.17104918322
-3.05367332069	-0.263418330173
0.182929300527	0.545732325132
2.73589695862	1.18397423965
7.15040603034	2.28760150758
8.37968062748	2.59492015687

(-8.82027162318, -1.7050679058)

Quickie #10: CAS and Spreadsheet

You can use the CAS from inside the Spreadsheet App. Here is a quickie to get you started.

1. Press **Apps Info** and select the Spreadsheet App icon. The app opens in Numeric view.
2. Tap the header for Column A to select it. Press **Shift** **=** to insert the equal sign. Press **Shift** **x²** to enter the square root radical.
3. Press **Vars Chars A** to open the Variables menu. Tap **Spreadsheet**, tap **Numeric**, and select the variable **Row**.
4. Tap **CAS** to activate the CAS and press **Enter** to see Column A fill with the square roots of the counting numbers.



Use the variables *Row* and *Column* to define entire rows and columns in the spreadsheet with a single command. Use the CAS to get symbolic results and let your students look for the patterns!

You have now seen 10 quickies that illustrate the power and simplicity of HP Prime. Be sure to sign into the HP Prime Teacher Community Forum to see more activities from Algebra to Calculus. From the Forum, you can also download the free HP Prime Virtual Calculator for your PC!

<http://hp-prime.vanillacommunity.com/entry/signin?Target=categories>