HP Prime: A Breakthrough in Mathematics Education Technology!

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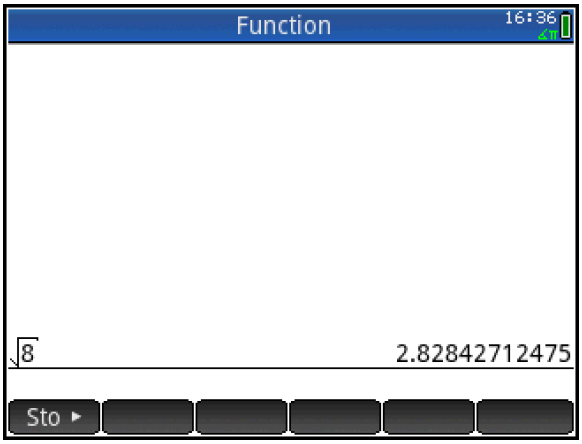
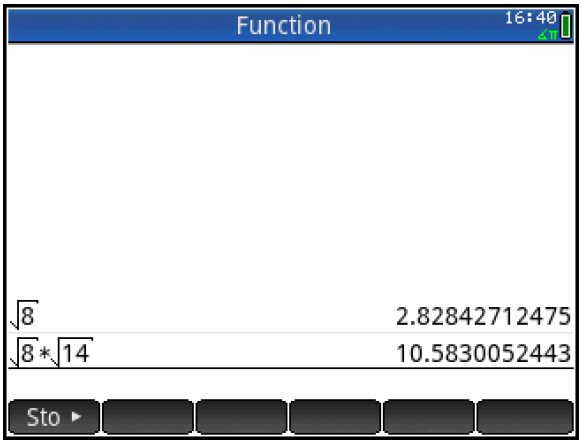
This hands-on workshop is a basic introduction to the HP Prime graphing calculator and its classroom wireless network via a series of 10 Quickies.

Quickie #1: Home view

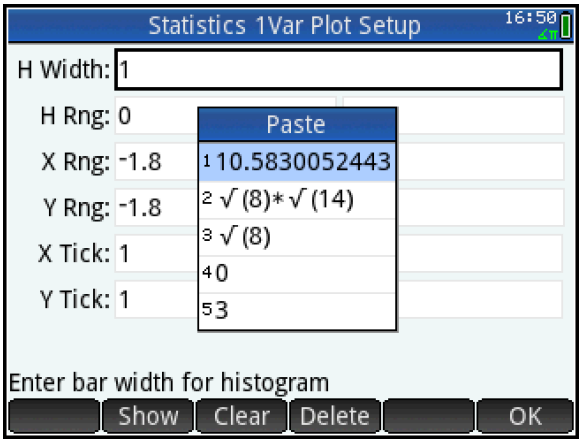
1. Press [On Off] to turn on your HP Prime
2. Press [Settings] to see the Home view.
3. Press [Shift] [x^2] [8] [Enter] to evaluate $\sqrt{8}$.



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 [×] [Shift] [x^2] [1 Program Y] [4 Matrix U] [Enter].

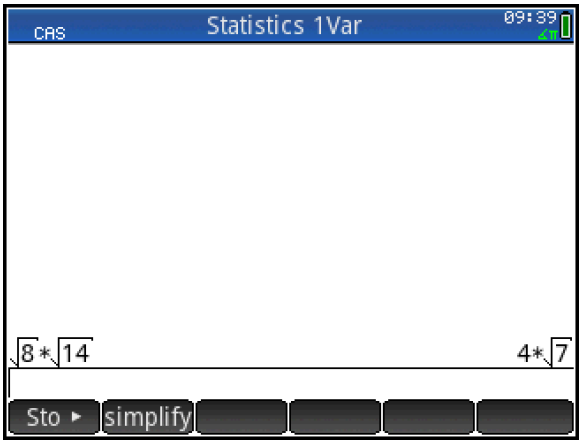


6. Tap on the last result to select it and press [Shift] [View Copy] (Copy). You just copied the 10.583... to the Prime clipboard. Now you can paste it anywhere by pressing [Shift] [Menu Paste] (Paste). You can see the clipboard also contains our last few entries.



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.



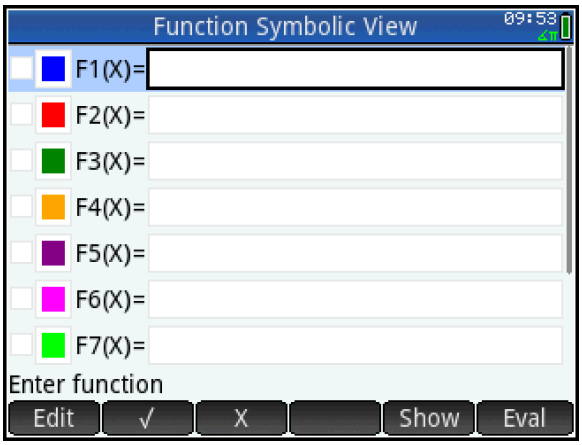
Home view returns numerical approximations while CAS always tries to return exact or symbolic results. It's up to you which view to use.

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 (Clear) to clear the entire history.

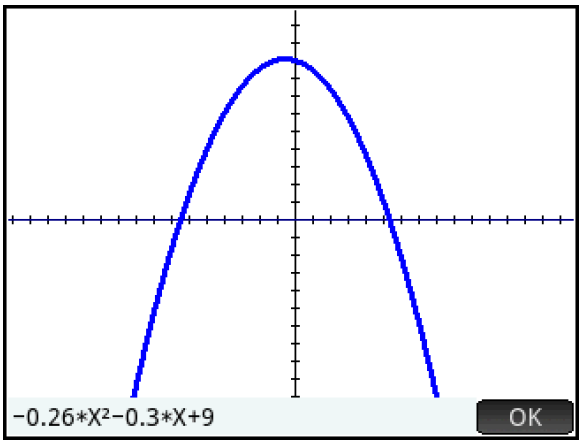
Quickie #3: The Function App

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.



2. Press Plot Setup to open Plot view. You will see a message that there are no functions to plot; just tap OK to continue.
3. 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.

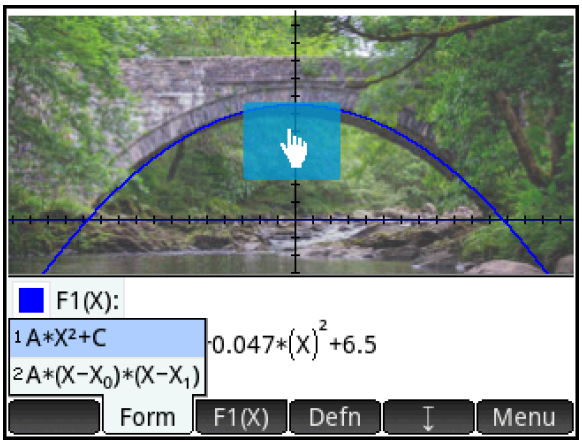
In Plot view, you can drag to pan the window or pinch to zoom in and out. You can also press + Ans ; and − Base ; to zoom in and out on the cursor. You can pinch just vertically or horizontally to zoom in one dimension as well. Try it now to get used to how easy it is.

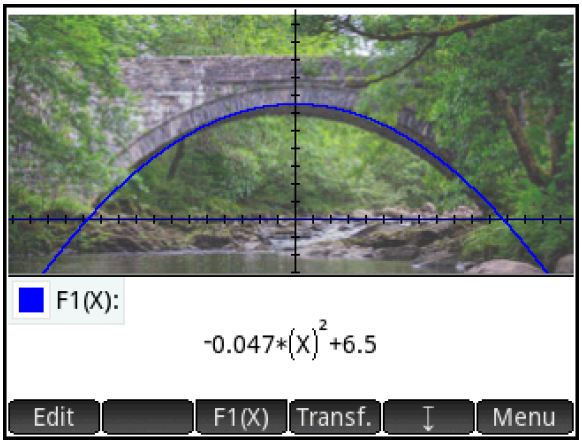
Quickie #4: Image as Background

This Quickie picks up where #3 ended.

1. Press Shift Plot Setup 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 Setup 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.



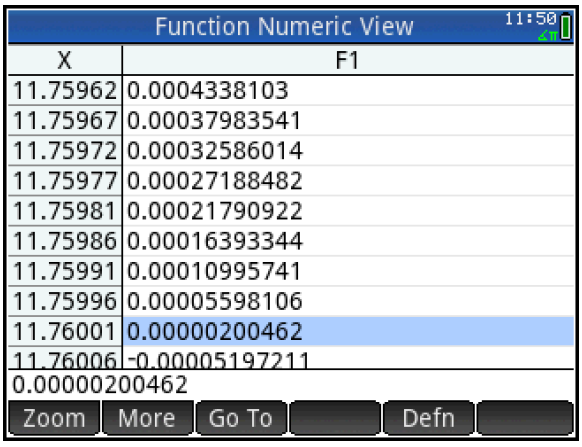


Many of the HP Prime apps have images built-in for you to explore. You can also import your own images using HP Connectivity Kit software.

Quickie #5: Table-zooming

1. Press Num Setup 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 Ans + ; to zoom in on that row of the table.
3. Repeat Step 2.

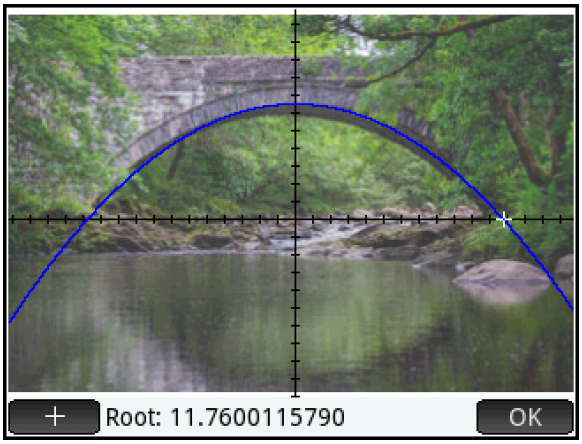
In the figure to the right, 11.76001 is our best approximation to the root so far.



Quickie #6: The FCN Menu

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

1. Press Plot Setup to return to Plot view. Tap near the root at X=11.76001, as in the figure to the right. Tap Menu, then tap Fcn and choose **Root**. The value of the root is displayed. Tap OK 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 CAS Settings to open CAS view. We will use CAS to find the root. Begin by entering F1(x)=0:

   ALPHA alpha Shift x^y F 1 Program Y ( ) N
   ALPHA alpha × X Shift = 0 Notes " "
   Enter ≈

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

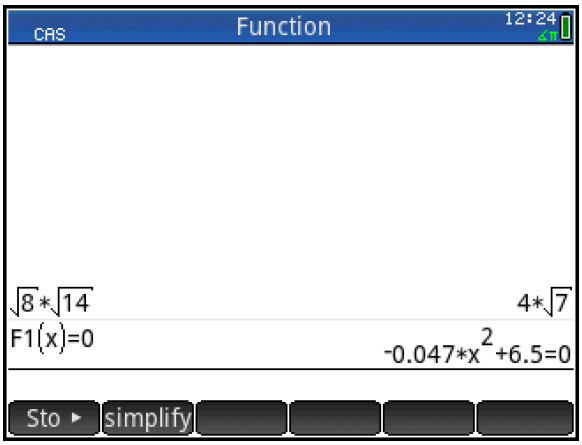
   − Base : 6 ≤,≥,≠ W = 5 [ ] V
   Enter ≈

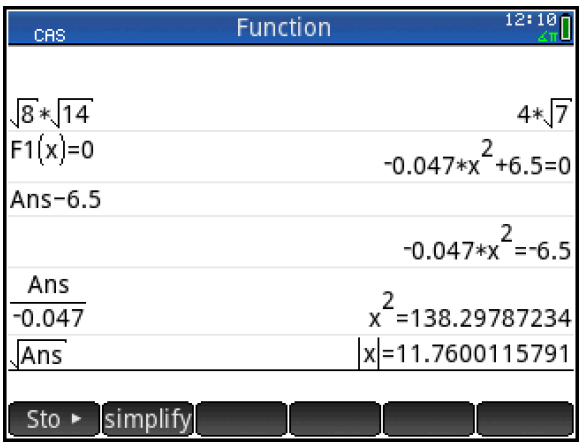
   Next, divide both sides by -0.047:

   ÷ x^{-1} T +/− |x| M 0 Notes " " = 0 Notes " "
   4 Matrix U 7 List Q Enter ≈

   Finally, take the square root of both sides:

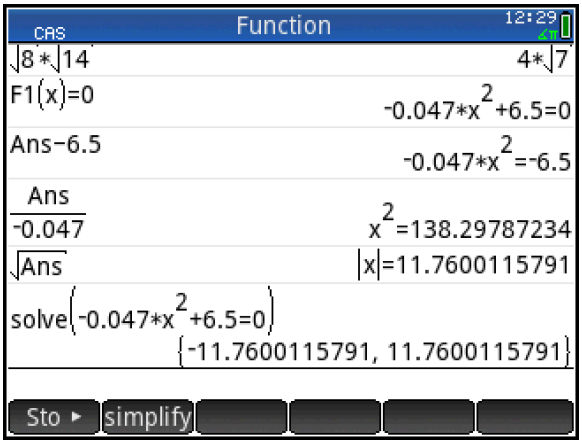
   Shift x^2 √ L Shift + Ans ; Enter ≈





Of course, you can solve the equation directly.

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

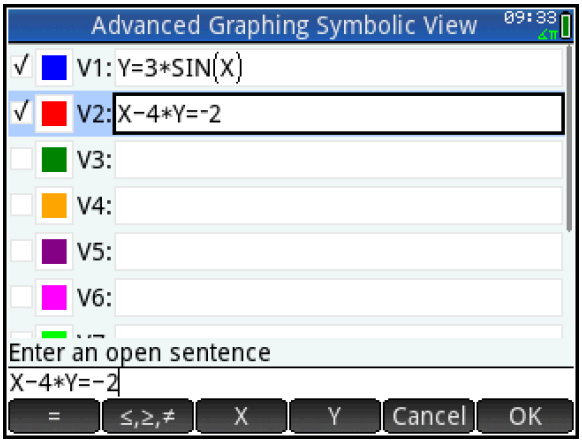


With CAS, the choice is yours. You can work step-by-step or all-at-once.

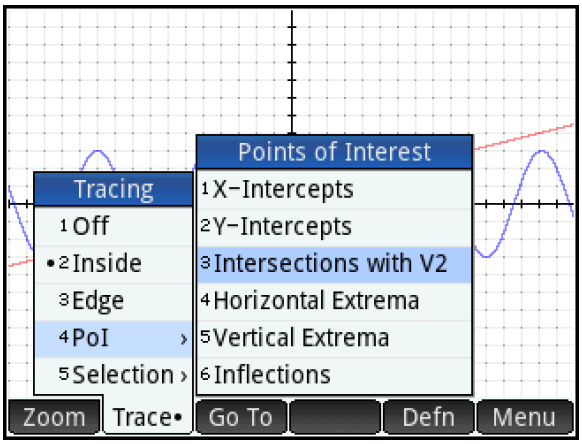
Quickie #8: The Advanced Graphing App

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.

1. Press Apps Info 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 X, Y, 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!

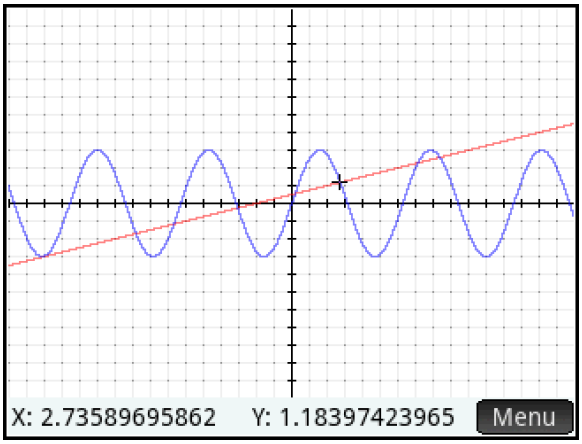


2. Press Plot Setup to see the graphs. As you can see, there are multiple intersections. Tap Menu and then tap Trace•. From the menu, select **PoI** (Points of Interest) and tap **Intersections with V2**.

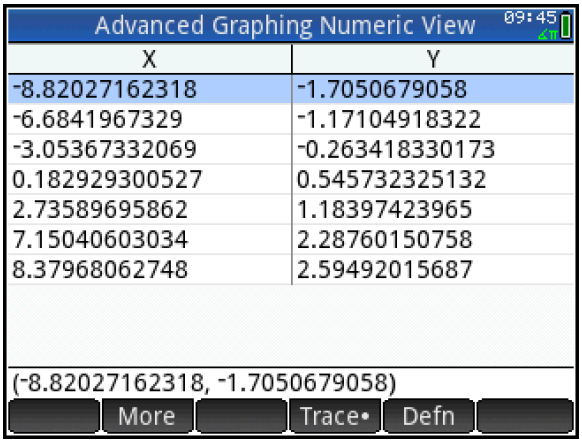


We have now trained the tracer to move among the intersections. Note that you can train the tracer to move among other points of interest as well, including x- and y-intercepts, extrema, or points of inflection.

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

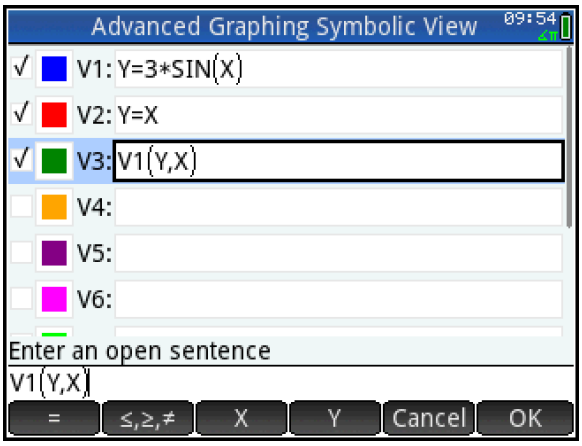


4. Press Num Setup to open Numeric view. Tap Trace• and again select **PoI** (Points of Interest) and tap **Intersections with V2**. Now you can see the entire collection of intersections in a table. There appear to be only 7. That first point looked like a point of tangency, but it is not.

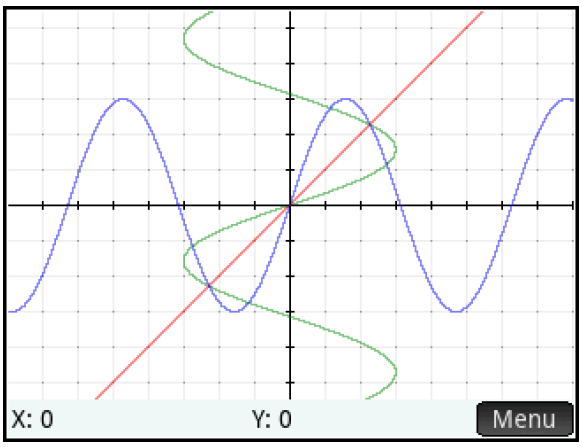


Quickie #9: More Advanced Graphing

1. Press Symb Setup to return to Symbolic view and change V2 to Y=X, as shown to the right. In V3, enter V1(Y, X). V3 is now defined to be the inverse of V1.

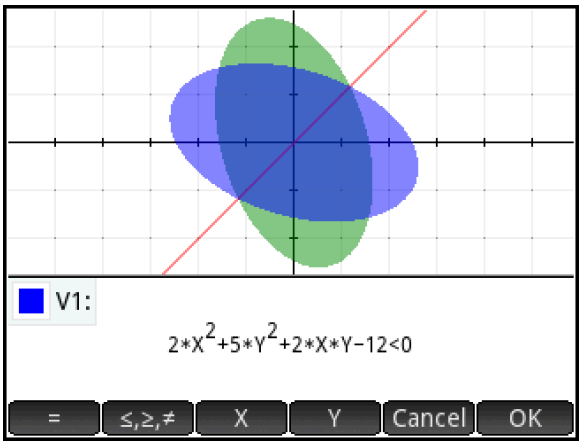


2. Press Plot Setup to see the graph and its inverse, as well as the line of reflection.



You can perform any of the standard transformations, such as reflections, translations, and dilations using standard mathematical notation.

3. Tap Menu to open the menu. Tap Defn to see the definition of V1(X, Y). Tap Edit to change the definition of V1. When you tap OK you will see your new pair of graphs! Now you have a simple app for visualizing inverses- and not just inverses of functions!

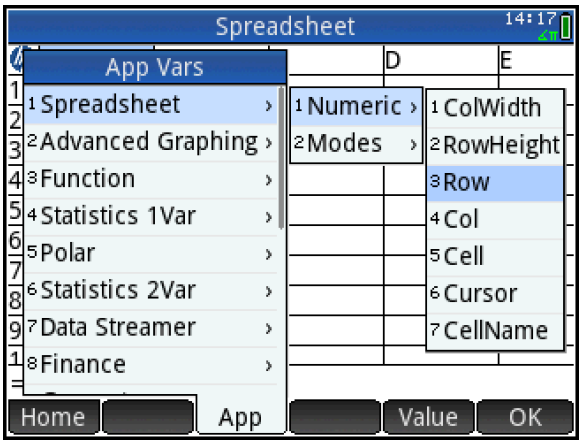


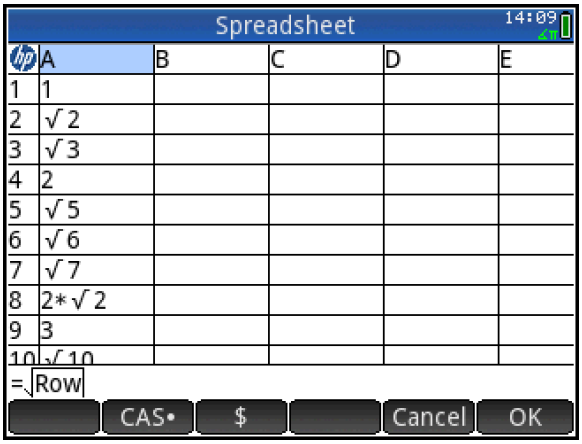
4. Press Apps Info to open the App Library. Tap Save and enter INVERSES as the name of your new app. Tap OK twice to see a new app- INVERSES- in your App Library.

You can send your new app to your students using the HP Prime wireless classroom network!

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