D. The Limit Definition

If you give your class this definition, here's one way to illustrate it with the calculator. I've never done this in a classroom so I don't know how well it works. You want to determine if $\lim_{x \to a} f(x) = L$. Enter f(x) in y1 and L in y2 and graph with appropriate range settings. One way to get a good viewing window is to zoom in using a box around the point (a,L).

Choose a value of ϵ and enter L+ϵ in y3 and L-ϵ in y4 and graph. Make sure that ϵ is small enough so that the lines show in your graphing window.

To determine an appropriate δ (if possible), use the **VERT** feature on the **GRAPH/DRAW** menu. Choosing **VERT** lets you position a vertical line by using the arrow keys. When the line is where you want it, press **ENTER**. Continue to use the arrow keys to position the second line and press **ENTER**. Press **GRAPH** to get out of **VERT** mode. The idea is to position the two vertical lines so that the portion of the graph of f which lies between the two vertical lines also lies between the lines $y=L\pm\epsilon$ (except possibly for the point (a,f(a)) if this exists). Assuming that it is possible to do this, you should now be able to determine an appropriate value of δ.

Since continuity is defined in terms of limits, there's not much new here. Jump discontinuities can be demonstrated using piecewise defined functions (Section 4).