Difference Equations on the TI 82

The TI 82 can easily be used to define difference equations and to view the results graphically and numerically.

Quick Recursive Calculation

The TI 82 is programmed to repeat the preceding computation if the ENTER key is pressed repeatedly. This can be used to do recursion by arranging that the result of the preceding calculation appears as ANS in the command line. Try this example: start by keying in 100 and hitting ENTER. (That makes 100 the value in the ANS memory.) Next key in: $\times$ .2 + 60 ENTER. Now keep hitting the ENTER key 4 or 5 times. Each time you hit ENTER, the calculator is computing ANS * .2 + 60. That is, the calculator is computing terms according to the difference equation $a_{n+1} = .2a_n + 60$. In a similar way, any difference equation of the form $a_{n+1} = f(a_n)$ can be computed. First key in a_0 and ENTER. Then key in the computation of f, using the ANS key each time you need to enter the variable for f. Thereafter, each time you hit ENTER, the calculator will apply f to the preceding result.

Mode Settings

Put the calculator into sequential mode as follows: push the **MODE** key, use the down arrow to get to the row starting with **FUNC**, then use the right arrow to get to **SEQ**, and hit **ENTER**. Then go down to the next line and over to **DOT**, and hit **ENTER** again. This will make graphs come up as discrete points. The combination **2ND QUIT** will return the calculator to its normal appearance.

Defining An Equation

Hit the button labeled **Y=**. You should see two lines, one for defining u_n and the other for v_n. You can enter an expression on the other side of the equal sign that is either an explicit function of n, or is recursive (depending on u_{n-1}). Notice that u_{n-1}, v_{n-1}, and n are available as **2ND** key choices above the **7**, **8**, and **9** keys.

Graph Setting

Next hit the **WINDOW** key, to assign initial values for n, u_n, and v_n (if you are using v_n), as well as the min and max x and y values for the graph. After making these entries, hit the **GRAPH** button to see the graph of your sequence or sequences.

Table Settings

The combination **2ND TBLSET** brings up a menu for creating a table of sequence entries. The **TBLMIN** variable is the first n value for the table; the **ΔTBL** variable specifies the step size between table entries for n. Once those are set, if you use **2ND TABLE** you will see a table of sequence values for u_n (and v_n, if defined). This table is scrollable using the up and down arrow keys.