


Handling Piecewise Functions on the TI-89

On the TI-89, you use the "when(" function to represent piecewise functions. An easy way to access it is by pressing , then "w".

The syntax is:

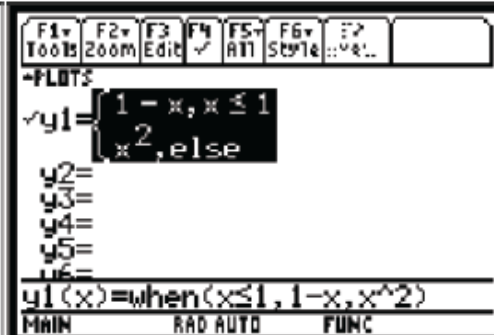
when(condition, true statement, false statement)

First, the calculator evaluates the "condition". If it is true, it executes the "true statement", and if not it executes the "false statement".



Here is an example, taken from Example 7 on p. 18 of the Stewart text:

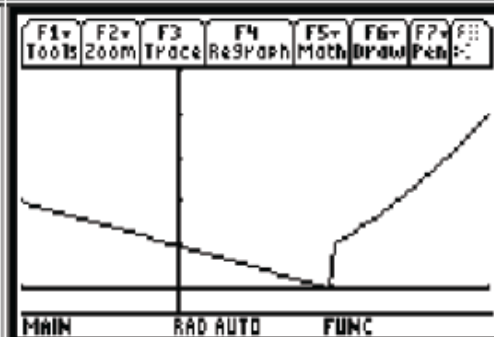
$$f(x) = \begin{cases} 1-x & \text{if } x \leq 1 \\ x^2 & \text{if } x > 1 \end{cases}$$







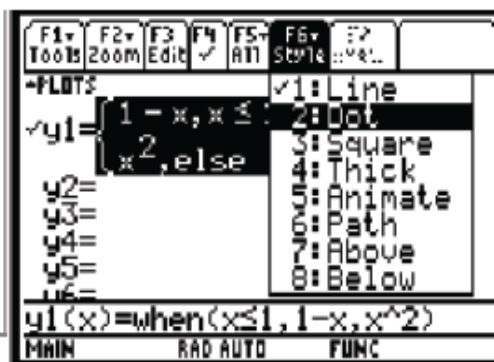
Here is the graph of f drawn in the window [-1, 2] by [-0.5, 5]. (Compare to Figure 19 on p. 18 of Stewart.)


The vertical line is an unfortunate consequence of the fact that the calculator automatically connects all points on a graph.

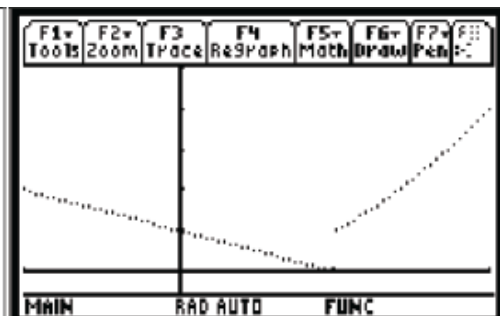
This problem is easily fixed, but keep in mind that it is **your responsibility** to understand that the calculator will not always draw correct graphs and to recognize that a graph is not correct.





The simplest fix is to tell the calculator not to "connect the dots" on the graph. To do this, press   to go to the "Y=" screen, then   to pull down the "F6: Style" menu, then select "2: Dot".

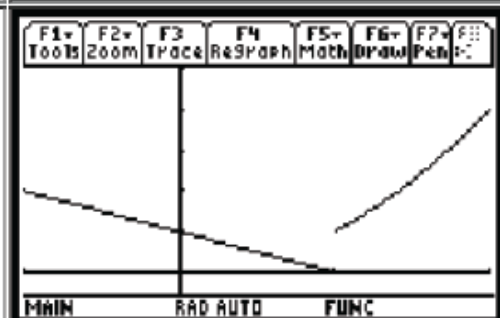


The graph at right has been redrawn () in dot mode. Note that the erroneous vertical segment is no longer shown.



Sometimes the "standard" dotted graph can be difficult to see. You can make it more solid by opening the window dialog () and setting xres = 1. The result is shown at right.

If you want the graph really dark, you can go back to the style menu () and select "3: Square".



The "when(" function can be nested inside other "when(" functions to construct piecewise functions that have more than two pieces, but this can get pretty complex.

Suppose we want to represent the piecewise function from Stewart, Example 9, p, 20:


$$f(x) = \begin{cases} x & \text{if } 0 \leq x \leq 1 \\ 2-x & \text{if } 1 < x \leq 2 \\ 0 & \text{if } x > 2 \end{cases}$$

A complication is that this function is not defined for $x < 0$. It can be accurately represented on the TI-89 using the following nested function:

`when(x ≥ 0 and x ≤ 1, x, when(x > 1 and x ≤ 2, 2-x, when(x > 2, 0, 1/0)))`

The last term, "1/0", assures that the value of the function will be undefined whenever x is less than zero.



Here is the graph of the function in the window [-1, 5] by [-1, 3]. It is drawn without axes (Go to the "F1 - Tools" menu on the "Y=" screen () and select "9: Format...") so that it is apparent that the domain is correct.

