

Plotting Piecewise Functions on the TI-82/83/83+/84+

Being able to visualize a piecewise function can greatly help in understanding the graph's behavior. However, the process of plotting piecewise functions by hand is not necessarily trivial. With a little work, we can use a graphing calculator to plot these functions and, at the same time, gain a visual guide to assist with plotting them by hand. We will explore graphing the following two piecewise functions on the TI-82/83/83+/84+ family of graphing calculators.

$$f(x) = \begin{cases} 2x, & x < 0 \\ x + 3, & x \geq 0 \end{cases} \quad g(x) = \begin{cases} \sqrt[3]{x}, & x \leq -1 \\ x^2 - 3x, & -1 < x < 4 \\ \sqrt{x-4}, & x \geq 4 \end{cases}$$

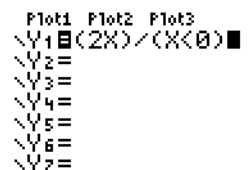
I will be using the TI-83+ for these examples, so my screens may look a little different than yours, but the steps are the same. Every piece of the piecewise functions will be entered separately as its own equation. That is, the first piece will be entered as Y_1 , the second piece as Y_2 , and so on.

Graphing $f(x)$:

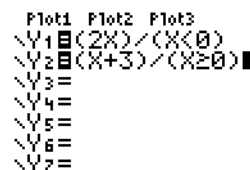
First, press the “Y=” key, located under the calculator's screen to the far left.



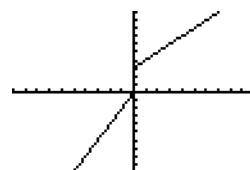
In parentheses, type the first piece, “2x”, in Y_1 . Press the divide key, and in parentheses again type the condition “ $x < 0$ ”. To find the “ $<$ ” symbol, press 2nd then the MATH key to display the TEST menu. The fifth item on the list should be “ $<$ ”. Your screen should now look like this:



Repeat this process for the second piece in Y_2 . The “ \geq ” symbol is the fourth item in the TEST menu. Your two functions should now look like this:



Press the GRAPH button (located under the screen to the far right) and watch your calculator draw the graph. You may have to restore your viewing window to the default settings by pressing the ZOOM button and then “6” for ZStandard (zoom standard).



Graphing $g(x)$:

For Y_1 , enter the first piece in the same manner as $f(x)$ above. To find the cube root symbol, press the MATH button and scroll down to the fourth item. Press ENTER to select.

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MATH NUM CPX PRB
1: Frac
2: Dec
3: 3
4: √(
5: √(
6: fMin(
7: fMax(
    
```

For the second piece, the condition “ $-1 < x < 4$ ” is not recognized by the calculator, so we need to enter it a little differently. “ $-1 < x < 4$ ” is the same as “ $x > -1$ and $x < 4$ ”. So, after the division sign and parentheses, enter “ $x > -1$ ”, then go back to the TEST menu, right arrow key over to LOGIC, and select “and”. Finally, enter “ $x < 4$ ” to finish Y_2 .

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TEST LOGIC
1: and
2: or
3: xor
4: not(
    
```

Enter the third piece into Y_3 similar to the first piece. Y_1 through Y_3 should now look like this:

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Plot1 Plot2 Plot3
√Y1(∛(X))/(X≤-
1)
√Y2(X²-3X)/(X>-
1 and X<4)
√Y3(√(X-4))/(X≥
4)
√Y4=
    
```

Press GRAPH and watch it work!

