

Calculator Quirks for the TI-83+

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Having worked with graphing calculators for a number of years now, I recently took stock of the tricks that I have learned over that time. The guiding principle of my mind seems to be that whatever I have learned is already known to the vast majority of my colleagues and so there is no point submitting the following list. However, on the off chance that one or two of the items might contribute to someone's "Eureka!" experience and also, incidentally, in the interest of a certain honorarium, I present for your perusal this batch of calculator miscellany.

1. Equation On/Off Switch

When working with a number of equations to be graphed, rather than entering and graphing and then clearing each one separately, all equations to be worked with can be entered simultaneously. The equals sign in the Y= window can be selected or de-selected, turning the equations on and off. Only the highlighted equations will graph. I find this useful not only for myself, but also for students. Near the beginning of each class, I have a quiz and while they are working on the quiz, I write notes for the day on the board. Students who are finished early can enter the equations on their calculators and are then ready when that day's material is presented.

```
Plot1 Plot2 Plot3
\Y1=X2+2X-1
\Y2=3X2-5X+2
\Y3=-X2+4X-3
\Y4▣-X2+1
\Y5=■
\Y6=
\Y7=
```

Figure 1 - Of the four equations entered, only Y₄ will graph.

2. Multiple Parameter Variations

Sometimes in an investigation, students are asked to enter multiple equations so that they can see the effects of variations in certain variables. For example, using $y = mx + b$, students are asked to enter the following values for b : $\{-3, -2, -1, 0, 1, 2, 3\}$. Rather than entering separate equations, the values can be input in List. Procedure is STAT, Edit. Clear values in List1 and then enter $\{-3, -2, -1, 0, 1, 2, 3\}$ into that list. Then enter the equation $Y1 = x + L1$ and the calculator will graph all seven lines with the one input.

L1	L2	L3	Z	Plot1	Plot2	Plot3
-3				Y1	X+L1	
-2				Y2		
-1				Y3		
0				Y4		
1				Y5		
2				Y6		
3				Y7		

Figure 2 - Parameters entered in L1.

```

Plot1 Plot2 Plot3
\Y1 X+L1
\Y2
\Y3
\Y4
\Y5
\Y6
\Y7

```

Figure 3 - Equation as entered on the Y= screen.

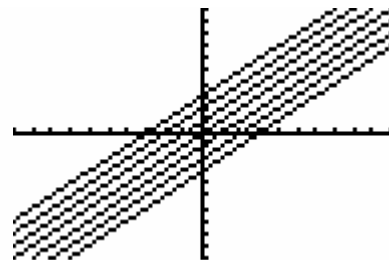


Figure 4 - Out put from equation as entered in Figure 3.

The same list can be used for showing changes in slope. For another example, when exploring quadratics of the form $y = a(x - p)^2 + q$, the same list will illustrate the effect of changes in the variables a , p , and q .

```

Plot1 Plot2 Plot3
\Y1 L1 X^2
\Y2 (X-L1)^2
\Y3 X^2+L1
\Y4
\Y5
\Y6
\Y7

```

Figure 5 - Equations entered for the above quadratic exploration.

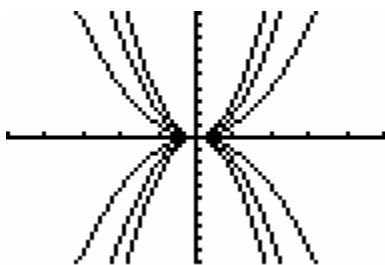


Figure 6 - Graphic output for equation Y1.

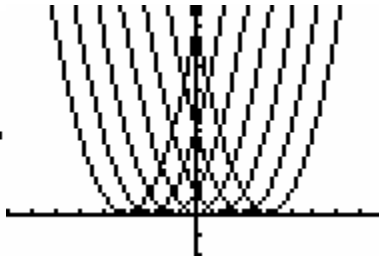


Figure 7 - Graphic output for equation Y2.

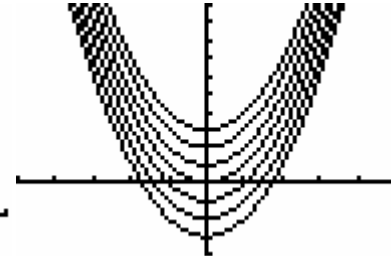


Figure 8 - Graphic output for equation Y3.

3. Using the Quadratic Formula

Occasionally, formulas require the use of a \pm notation. While the calculator does not specifically have this symbol, one can be faked using List. Enter the values 1 and -1 into L1. Then work the formula using L1 in place of the \pm as follows:

$$x = \frac{-b + L1\sqrt{b^2 - 4ac}}{2a}$$

For the quadratic $6x^2 + x - 15 = 0$, the procedure would result in the following answers

```

(-1+L1*J(1^2-4(6)
(-15))) / (2*6)
{1.5 -1.6666666...

```

Figure 9 - This shows the quadratic formula input and the resulting answers.

4. Limiting the Domain of a Function

It is sometimes helpful to be able to limit the domain of a function, so that only part of a graph will be shown. In Math 20 Pure, a question is asked concerning the method of limiting the domain of a quadratic function so that its inverse will also be a function. The inverse of a quadratic function results in a parabola opening to the left or right and this graph fails the Vertical Line Test (a vertical line drawn through the graph will intersect the inverse in more than one place) as illustrated in the output in Fig.10.

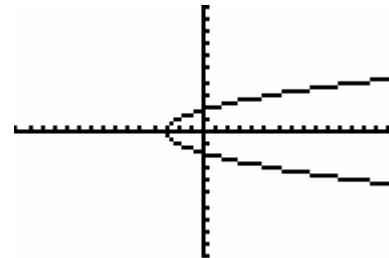


Figure 10 - Graph of the inverse of $y = x^2 - 3$.

```

Plot1 Plot2 Plot3
\Y1=X^2-3/(X≥0)
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

Figure 11 - The graph of $y = x^2 - 3$ is followed by a restriction limiting the graphed output to x-values greater than or equal to 0.

Restrictions on the domain of a function can be input into the Y= Window. Following the function, insert a divide sign followed by the desired restriction enclosed by parentheses as illustrated in Fig.11. The signs, equality and inequality, as well as the logic statements, and, or, and not, are found using the second function MATH key. The graphed output for the statement in Fig. 11 is shown in Fig. 12 and Fig. 13 shows the limited quadratic, the related inverse and the reflecting line $y = x$ in the same window.

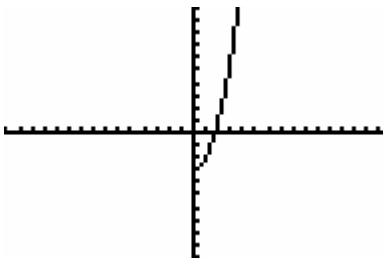


Figure 12 - Graphic plot of $y = x^2 - 3$ with x-values limited to those greater than or equal to 0.

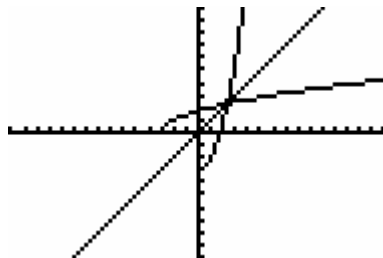


Figure 13.

5. Graphing Reciprocals

When I first started using the graphing calculator to graph reciprocal functions, I would laboriously enter each function by hand. A few years (yes, years!) later I discovered a shortcut that vastly sped up the entry time. If the original function is entered in Y_1 , the reciprocal function can be entered in Y_2 as in Figure 14. The procedure for this is as follows: For Y_2 , enter $1/$, then VARS, Y-VARS, Function, 1, which will enter Y_1 as the denominator. Then no matter what function you enter as the original function, the calculator will graph both that function and its reciprocal.

```
X= Plot1 Plot2 Plot3
\Y1 X+2
\Y2 1/Y1
\Y3 =
\Y4 =
\Y5 =
\Y6 =
\Y7 =
```

Figure 14

I hope these tips prove useful for you. I am always glad to find out something new that will help my teaching and would be delighted to hear from you. You can contact me through this website (under Teachers).