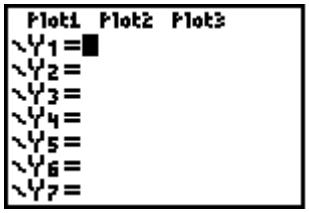
TI-83/84 PLUS CALCULATOR – DIRECTIONS for FUNCTION USED in MAT 109

Functions

There are several ways to enter a function into the TI-83 graphing calculator. For basic use, we recommend simply entering a function into the equation editor and then working with it from there.
To begin, press **Y=** to access the equation editor (the Y= menu). The TI-83 can accommodate up to 10 functions.



To enter a function, simply type in the algebraic expression used to define the function. For example, to enter the quadratic function *f* defined by $f(x) = x^2 + 3x - 7$, type

x-VAR x^2 (or $\wedge$ 2) + 3 x-VAR − 7 ENTER

Once the function is entered, then you can perform a variety of tasks; for example, evaluate the function at a given input value, graph the function, or make a table of functional values.

Absolute Value

The absolute value function is found either in the catalog or in **MATH**. The symbol for absolute value is two straight bars, | |, but the calculator uses the letters **abs(**

To evaluate an absolute value, such as $|7-12|$

1. Press **MATH.**
2. Hit **RIGHT BLUE ARROW**
3. Choose **NUM**
4. Choose **1: abs (** or just hit **ENTER**.
5. Enter the expression after the open parenthesis and then close the parentheses; **abs (** $7-12$ **)**
6. Hit **ENTER** to see the answer.

To graph an absolute value function, such as $f(x) = |x+5|$

1. Hit $Y=$
2. Press **MATH.**
3. Hit **RIGHT BLUE ARROW**
4. Choose **NUM**
5. Choose **1: abs (** or just hit **ENTER**.
6. Enter the function after the open parenthesis and then close the parentheses; $Y = abs(x+5)$
7. Hit **GRAPH**.

Set Window Dimensions

Press WINDOW to see the window used to graph a function.

Xmin establishes the smallest x value, the left end of the x axis.

Xmax establishes the largest x value, the right end of the x axis. This value must be larger than the value entered for Xmin.

Xscl defines the spacing between tic marks along the x axis. To turn off the marks, set Xscl to 0.

Ymin establishes the smallest y value, the bottom of the y axis.

Ymax establishes the largest y value, the top of the y axis. This value must be larger than the value entered for Ymin.

Yscl defines the spacing between tic marks along the y axis. To turn off the marks, set Yscl to 0.

Xres defines the distance, in pixels, between consecutive evaluated values of x. The default is 1.

To change a setting, select that value using the cursor keys and type the desired value. Press GRAPH.

Calculate Menu

Press 2nd TRACE to view the calculate menu.

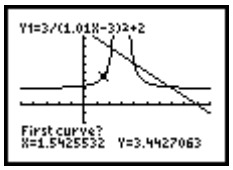
Press the number associated with an option or use the cursor keys to select an option and press ENTER.

Press 1 to select value which evaluates a function for a given value of x.
Press 2 to select zero which finds an x intercept.
Press 3 to select minimum which finds a relative minimum.
Press 4 to select maximum which finds a relative maximum.
Press 5 to select intersect which finds a point of intersection.
Press 6 to select dy/dx which finds the derivative of a function.
Press 7 to select $\int f(x)dx$ which finds the value of the integral of a function.

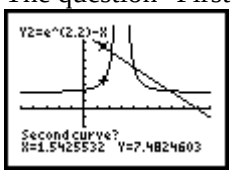
Intersect Option

The intersect option is used to determine a point of intersection of two graphs. Press 2nd TRACE.

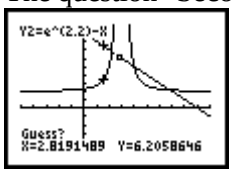
Press 5. (The intersect option can also be obtained by using the  to select option 5 and pressing ENTER.)



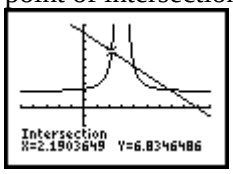
The cursor appears on the first graph indicated by the equation in the upper left-hand corner of the screen. (The selected curve is changed using the up or down cursor keys. Press ENTER when the desired curve is selected.)
The question "First curve?" appears at the bottom of the screen. Press ENTER.



The question "Second curve?" appears at the bottom of the screen. Press ENTER.



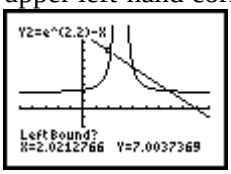
The question "Guess?" appears at the bottom of the screen. Move the blinking cursor close to the desired point of intersection and press ENTER. The coordinates of the point of intersection appear at the bottom of the screen. Here, the point of intersection is about (2.2,6.8).



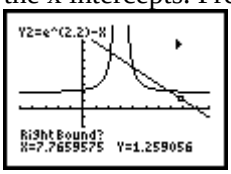
Zero Option

The zero option is used to find an x intercept. Press 2nd TRACE.

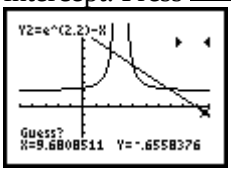
Press 2. (The zero option can also be obtained by using the ▼ to select option 2 and pressing ENTER.) Since a function may have more than one x intercept, specify an interval containing the desired x intercept. (The equation in the upper left-hand corner indicates finding an x intercept on the graph of the second function.)



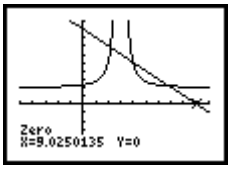
The question "Left Bound?" appears at the bottom of the screen. Use the ◀ to move the blinking cursor to the *left* of one of the x intercepts. Press ENTER.



The question "Right Bound?" appears at the bottom of the screen. Use the ▶ to move the blinking cursor to the right of the x intercept. Press ENTER.

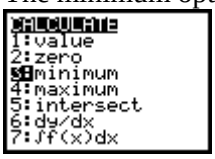


The arrows at the top of the screen indicate the boundaries between which the calculator will give the root. (The arrows must point toward each other and an x intercept must lie between them.) The question "Guess?" appears at the bottom of the screen. Locate the cursor between the established boundaries. Press ENTER.

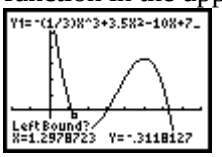


Minimum Option

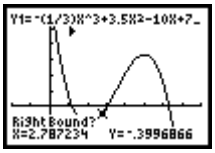
The minimum option is used to find a relative minimum. Press 2nd TRACE.



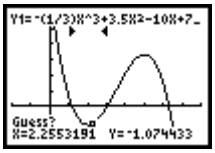
Press 3. (The minimum option can also be obtained by using the ▼ to select option 3 and pressing ENTER.) Since a function may have more than one relative minimum, specify an interval containing the desired low point on the graph. (The function in the upper left-hand corner indicates finding a relative minimum on the graph of the given function.)



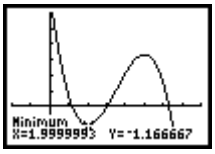
The question "Left Bound?" appears at the bottom of the screen. Use the ◀ to move the blinking cursor to the *left* of the relative minimum. Press ENTER.



The question "Right Bound?" appears at the bottom of the screen. Use the ▶ to move the blinking cursor to the right of the relative minimum. Press ENTER.



The arrows at the top of the screen indicate the boundaries between which the calculator will give the relative minimum. (The arrows must point toward each other.) The question "Guess?" appears at the bottom of the screen. Locate the cursor between the established boundaries. Press ENTER.

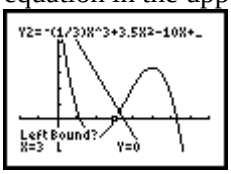


The coordinates of the minimum appear at the bottom of the screen. In this case, the minimum point is (2,-7/6).

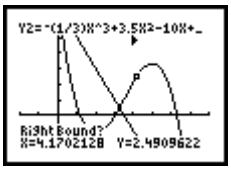
Maximum Option

The maximum option is used to find a relative minimum. Press 2nd TRACE.

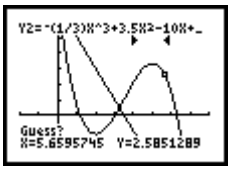
Press 4. (The maximum option can also be obtained by using the ▼ to select option 4 and pressing ENTER.) Since a function may have more than one relative maximum, specify an interval containing the desired left point on the graph. (The equation in the upper left-hand corner indicates finding a relative minimum on the graph of the given function.)



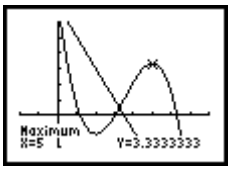
The question "Left Bound?" appears at the bottom of the screen. Use the ◀ to move the blinking cursor to the *left* of the relative maximum. Press ENTER.



The question "Right Bound?" appears at the bottom of the screen. Use the ▶ to move the blinking cursor to the right of the relative maximum. Press ENTER.



The arrows at the top of the screen indicate the boundaries between which the calculator will give the relative maximum. (The arrows must point toward each other.) The question "Guess?" appears at the bottom of the screen. Locate the cursor between the established boundaries. Press ENTER.



The coordinates of the maximum appear at the bottom of the screen. In this case the maximum point is (5,10/3).

Piecewise Functions

To graph a piecewise function, you must enter each rule (each formula of the function) in ***parentheses*** with the interval of the domain for that rule in a second set of ***parentheses*** following it. In Y_1 enter the function using the addition ***symbol (+)*** to separate the different rules (formulas) **OR** enter each different formula in $Y_1 =$, $Y_2 =$, $Y_3 =$, etc. Also, you should change from **CONNECTED** to **DOT MODE.** Try **ZOOM ZDECIMAL** or **ZOOM ZINTEGER** if the function contains isolated points.

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Method 1

Example 1: $f(x) = \begin{cases} 1 & x < 0 \\ x^2 + 1 & x \geq 0 \end{cases}$

Enter: $Y_1 = (1) \div (x < 0)$

$Y_2 = (x^2 + 1) \div (x \geq 0)$

1. Hit $Y =$
2. $Y_1 = (1) \div (x < 0)$

   $Y_2 = (x^2 + 1) \div (x \geq 0)$

- x is found on the X, T, θ, n button
- Inequalities are found in **TEST** by hitting **2ND MATH** and **TEST** will be highlighted, and then choose the appropriate inequality by entering its number.

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Piecewise Functions

Method 2

Example 2: $g(x)=\begin{cases} x+4 & x\le -2 \\ 2 & -2<x<2 \\ 4-x & x\ge 2 \end{cases}$

Enter: $Y_1=(x+4)(x\le -2)+(2)(-2<x)(x<2)+(4-x)(x\ge 2)$

OR

Enter: $Y_1=(x+4)(x\le -2)$

$Y_2=(2)(-2<x)(x<2)$

$Y_3=(4-x)(x\ge 2)$

Like this:

1. Hit $Y=$
2. Hit **LEFT BLUE ARROW** two times
3. Hit **ENTER** six times for **DOT MODE**
4. Hit **RIGHT BLUE ARROW** two times
5. Hit $(x+4)\,(x$
6. Then hit **2ND MATH** and **TEST** will be highlighted. Choose **6:** and $\le$ will be pasted.
7. Hit $-2)$
8. Hit $+$
9. Hit $(2)\,(-2$
10. Then hit **2ND MATH** and **TEST** will be highlighted. Choose **5:** and $<$ will be pasted.
11. Hit $x)$
12. Hit $(x$
13. Then hit **2ND MATH** and **TEST** will be highlighted. Choose **5:** and $<$ will be pasted.
14. Hit $2)$
15. Hit $+$
16. Hit $(4-x)(x$
17. Then hit **2ND MATH** and **TEST** will be highlighted. Choose **4:** and $\ge$ will be pasted.
18. Hit $2)$