TI-83 Plus
Graphing Calculator Introduction

If you found this document in the **Content** Section of a D2L course, you might want to check the **Links** Section to see whether there is a link to a web site on graphing calculators. It would have more complete reference material than is to be found here.

This document will cover some of the ways the graphing calculator will be used in various UW Colleges mathematics courses. First an arithmetic expression will be given, to make sure you have no difficulty entering that correctly; then follows a word on the notation used here. After that special keys and menus are discussed, then instructions are given for using graphs.

Arithmetic

See if you can correctly compute 3^4; the key to use for raising a number to a power is the [^] key, located below the [CLEAR] key and above the [÷] key. The following expression requires you to make correct use of parentheses. Make sure to use the subtraction key [-], not the negative number key [(-)]. If you get 617.5 you may proceed. Press [CLEAR] to clear the display.

$$\frac{800-\dfrac{767}{13}}{\dfrac{23}{5}-\dfrac{51}{15}}$$

Notational Convention

Most of the keys on the TI-83 Plus have a word printed above them in gold lettering. You are no doubt aware that the functions labeled in gold require you to press the gold [2nd] key before pressing the key underneath the gold lettering. When instructions are given here, they will indicate the use of the [2nd] key and will indicate the following key by the label above it rather than by the lettering on the key. For example, the instruction to turn off the calculator would be "press [2nd] [OFF]", not "press [2nd] [ON]".

Some Special Keys

Besides the [2nd] key, there are other special keys; note, for instance, the four arrow keys in the upper-right part of the keyboard. The white triangle on a blue key indicates one of the four directions. Instead of trying to picture those keys here, words such as "move to the right" or "move down two lines" will be used. The five blue keys right under the viewing window, along with their [2nd] counterparts, are of particular importance for problems involving graphing; be sure to know those by name. Other keys to be aware of are [MODE], [2nd] [QUIT], [STAT], [2nd] [LIST], [2nd] [ANGLE], [CLEAR], [ENTER], [DEL] and [2nd] [INS]. The last two are especially useful for correcting mistakes. Use [2nd] [QUIT] to get back to the "normal" calculator screen after using [MODE], [STAT], [GRAPH], [2nd] [LIST] or [2nd] [ANGLE]. Turn on your TI-83 Plus graphing calculator and try some of those keys now, each time pressing [2nd] [QUIT] to return to "normal". Another special key is the [X,T,T ,*n*] key which is used for entering the variable X.

Menus

You may have noticed that some of the keys you just pressed cause various lists or *menus* to be displayed. Sometimes multiple menus become available when a single key is pressed. To see this press [ZOOM] and notice that the words ZOOM and MEMORY appear at the top of the screen with a list of terms underneath. The items in the list are *commands* on the ZOOM menu. Press the right arrow and they are replaced by a new list of commands on the MEMORY menu. To execute a command, either press its number or move the highlight down to it and press [ENTER]. Display the ZOOM menu now and execute the ZStandard command. Then, when you display a graph, standard limits will be used for the display. Now press [MODE] and see which options or modes are selected. To select an item, move to it and press [ENTER]. Do this now, changing to Degree if Radian is selected or to Radian if Degree is selected. Otherwise, select the first option in each row. When you are finished, press [2nd] [QUIT].

Graphing an Expression

To prepare to enter an expression to be graphed, press the blue [Y=] key. Using the [CLEAR] and the arrow keys, clear any formulas that might be present. For Y_1, enter $X^3 - 6X^2 + 9X - 2$ and press [GRAPH]. Note that you enter the first exponent using the special exponent key used before, but you enter the second exponent with the [x^2] key on the left side of the calculator. Also observe that the multiplication sign is not needed in this context.

It appears that the interesting features of this graph are near the center of the screen and could be seen better if the rest of the graph were not displayed. Press [WINDOW] and set Xmin = -1, Xmax = 5, Ymin = -4 and Ymax = 4. Press [GRAPH] again.

It's possible to find coordinates of points on the graph by pressing the [TRACE] key, then using the left and right arrows. Try this and watch the display. You might think that you have no control over the points selected for display, but that is only partly true. Type the number 1.5, press [ENTER] and notice that the point at which x=1.5 is displayed. Unfortunately, there's no way to directly select a point at which y=1.5, but we'll find a less direct method later. It's important to understand the limitation of the [TRACE] key and not try to use it when another method is better.

Press [2nd] [CALC] to display the CALCULATE menu and press [ENTER] to select the "value" command. Type the number 1.5, press [ENTER] and notice that this gives the same result as with the [TRACE] key. Again press [2nd] [CALC] to display the CALCULATE menu but this time select the "maximum" command. This graph contains only one maximum, but another graph might contain more than one, so the calculator needs some prompting to find the maximum you are looking for. Use the left arrow key to move the blinking cursor to the left of the maximum, say to a point where $x \approx 0.6$, and then press [ENTER]. Next use the right arrow key to move the cursor to the right of the maximum, say to where $x \approx 1.4$, and then press

ENTER again. The last step is to indicate a guess. This time, rather than using the arrow key to move the cursor closer to the maximum, just type 1 and press ENTER a third time. The display should show x=1 (approximately) and y=2. Repeat this process to find the minimum the same way you found the maximum.

Another useful command on the CALCULATE menu is the "zero" command. Use it now to find where the graph crosses the x-axis between x=3 and x=4. Remember that it is sometimes quicker to type in a value of x than to use the arrow keys when responding to a prompt.

It was mentioned before that a way would be found to locate where a specific value of y occurs, say y=1.5. To do this it is necessary to press the Y= button again and enter 1.5 for Y_2. Now display the CALCULATE menu and select the "intersect" command. The prompts now are different. There could be several graphs—not just two—and many intersections, so it is necessary to indicate which two graphs' intersection is of interest. Make sure the blinking cursor is on the Y_1 curve and press ENTER. Then make sure the blinking cursor is on the Y_2 curve and press ENTER again. Finally, move the cursor near one of the intersections and press ENTER one more time. Notice that the coordinates are displayed. Repeat for each of the other two intersections.

The TI-83 Plus calculator can also provide a table of values corresponding to points on the graph, as will be seen when you press 2nd TABLE. Very likely, X will have the values 0, 1, 2, 3, …. To change that, press 2nd TBLSET to display the TABLE SETUP screen. Set two values, TblStart=0 and ΔTbl=0.2, then press 2nd TABLE again. Scroll up and down through the values that have been calculated. This will be especially useful when you need to copy a graph onto graph paper.

Both ZOOM and WINDOW need to be explored further. Choose Zsquare from the ZOOM menu and note that a unit is now the same size in both the horizontal and vertical directions. A square will now appear square, and a circle will now appear circular. Another possibility is that a particular interval, say from x=0 to x=2.5 is of special interest, but you'd rather not try to figure out what limits on y would show that interval to best advantage. Press WINDOW and set Xmin = 0, Xmax = 2.5 and Xscl = .5, then press ZOOM and select the ZoomFit command. Since this is the tenth command on the list, press the up-arrow key to reach it directly. The ZoomFit command computes the values of Ymin and Ymax so that the portion of the graph displayed will fill the screen vertically.

Before turning off the calculator, execute the Zstandard command again (from the ZOOM menu) and clear the equations entered for Y_1 and Y_2.