MATH 1351 TI-85 EXERCISE II
Part 1
Introduction to graphing

Name: ______________________________ SID: ___________________________

To activate the TI-85 graphing utility choose **GRAPH** from the keyboard. A screen menu will appear. The little wedge at the right indicates there is more stuff in the menu. To see it press **MORE** from the keyboard. Do this until you cycle through the entire GRAPH menu. There are 13 items in this menu, of which we will use 8 during the course of these exercises.

Any screen menu item is accessed via pressing the **F** key directly beneath it. Choose **y(x)=** from the graph screen menu. (Press **F1** from the keyboard.) This activates a new screen menu (again with more stuff in it). Pressing **EXIT** from the keyboard will exit this menu and activate the previous menu. Try it and then return to the **y(x)=** menu.

For our purpose it is best to begin with a "clean slate." If there are functions defined on your screen (y1= something, y2 = something, etc) choose **DELf** (short for delete f) from the screen menu successively until they are all deleted. Now the blinking cursor is asking you to define the function y1. Define

$$y1 = x.$$

To do this either choose **x-var** (x as a variable) from the keyboard or choose **x** from the screen menu. Either of these tells the TI-85 that x represents a variable, not just the letter "x". Choose **EXIT** from the keyboard to return to the GRAPH menu, and then choose **GRAPH** from the screen menu to graph the function y1=x. To get the viewing window we want for this exercise, choose **ZOOM** from the GRAPH menu and then **ZSTD** (zoom standard) from the ZOOM menu.

Return to the y(x)= menu. Press the *arrow down* button. The TI-85 is now asking you to define a new function y2. Define

$$y2 = y1\text{^}2.$$

To do this choose the variable **y** from the screen menu, then **1**, and either **x** ***squared*** or **^2** from the keyboard. What is the function y2 in terms of x?

y2 = ___________ in terms of x.

Now choose **GRAPH** from the GRAPH menu. You should observe that both y1 and y2 are graphed on the same axes.

Question: Does the graph of y2 dip below the graph of y1 near (0 , 0)?

To answer this question we need to zoom in on (0 , 0) to get a closer view of the two graphs. Choose **ZOOM** then **ZIN** from the appropriate screen menus. Notice that the x and y coordinates of the cursor position are displayed at the bottom of your screen, the default position being at the center of the screen. The *up/down/left/right* arrows could be used to position the cursor anywhere on the screen; however, we will leave it at (0,0) since that is the point we want

to observe more closely. Choose **ENTER** to activate the zoom. One zoom in is enough to answer the question. In fact we observe that y2 does dip below y1. In what interval does this occur?______________ Explain this phenomenon it terms of the relation between numbers and their squares.____
____

Now define a new function

y3 = y2 + y1.

What is this function in terms of x?

y3 = ___________________ in terms of x.

Graph y1 and y3 on the same axes with the standard viewing window. Note, to graph only y1 and y3 you need to "turn off" y2. The item **SELCT** (short for select) in the **y(x)=** screen menu acts as an on/off switch. Arrow up of down until the cursor is blinking on y2, then choose **SELECT** from the screen menu to "turn off" y2. You can tell whether a function is "on" or "off" by whether or not the = is highlighted. The same procedure would turn an "off" function "on."

With y1 and y3 graphed on the same axes we ask the same question as above.

Question: Does the graph of y3 dip below the graph of y1 near (0,0)?

We approach the question in the same way. Zoom in on (0,0) and see what happens. This time 1 zoom is maybe not enough. To zoom in again simply press **ENTER** again. What happens?______
____
What happens after the third zoom in?____
____
Can this question be answered by looking only at the graphs on the TI-85?____________________
Explain. ____
____
Describe what appears to be happening as we zoom in on the graphs of y1 and y2 closer and closer to (0,0).____
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Attach a sketch the graph of the function

y = (x^2)(x+1)(x-1)^3**.**

(Pressing **CLEAR** after graphing removes the screen menu from the screen, thus producing a nicer picture. To get the menu back press **EXIT**)

Just for fun, graph some other polynomial functions (not just quadratics), choose a point on the graph and zoom in 3 or 4 times on that point. Each time the graph should eventually start to look like a line. Maybe we aught to really understand lines before worrying about more complicated functional behavior.

Part 2

Lines, lines, and more lines

Delete the functions in your graphing utility and began anew with the following set. Graph the function y1= (1/3)x. Try the **ZDECM** viewing window from the **ZOOM** menu. Next graph (on the same axes) y2=(3/4)x, then y3=x, then y4=2x, and y5=3x. What is the effect on the graph of choosing a bigger value for b (>0) in the function y=bx?____

Repeat the above exercise with the value of each coefficient of x negated. For example, let y1=(-1/3)x, and so on. (Negation is not the same operation as subtraction. After all, subtraction is a binary operation: to subtract one number from another you have to have two numbers to start with. To negate a number choose **(-)** from the keyboard.) What is the effect on the graph of choosing a bigger value for b (b>0) in the function y=-bx?

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The question of just what is meant by "steepness of a line" arises. To consider this question graph the line y1= 2x. Use the **ZDECM** followed by the **ZSQR** viewing window. (ZSQR is short for zoom square, and has the effect of making the x and y axes have the same scale. Since the screen is not a square, the default x and y scales are different.) Exit back to the GRAPH menu and choose **TRACE**. The cursor appears at the center of the graph, *arrow left* causes the cursor to trace the graph to the left, *arrow right* causes it to trace the graph to the right. In addition the x and y coordinates of the cursor are displayed at the bottom of the screen. As you trace along the graph of y1=2x to the right, what is the change in the value of x from one point to the next?_____ (It might interest you to know that ZDECM is short for "zoom decimal.") What is the corresponding change in the value of y from one point to the next?______ We define

the *slope of a line* to be *(the change in y)/ (the change in x).*

This is our measure of the steepness of a line. Use TRACE to determine the slope of each of the above lines, and record the results in the spaces provided.

y=(1/3)x:	slope = _________	y=(3/4)x:	slope = ________
y = x:	slope = _________	y = 2x:	slope = ________
y = 3x:	slope = _________	y = (-1/3)x:	slope = ________
y = -2x:	slope = _________	y = -3x:	slope = ________
y = mx:	slope = _________	y = 3:	slope = ________

Graph the lines given by y = 2x + b for various values of b. What is the effect of changing the values of b on these graphs, and what is the relation between all these graphs?

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