Introduction to Graphing Calculator Fun

Please read and follow the instructions. If you just play with your calculator, you can figure out most things. You are responsible for knowing these skills so do a good job on this sheet and ask for help when you need it.

Your graphing calculator (gc) is a great tool and you will learn to use it this year. It is important to remember that it is only a tool, it does not think. It only does what you tell it so you need to know what to tell your calculator and how to interpret what it does. You will have times this year when you need to use your gc and times when you will not be allowed to use it.

1. Basic Calculations: The "home page" is when you use your gc like any other calculator. You can get to this page by hitting QUIT (2^{nd} MODE). Some special buttons to know are DEL, INS (2^{nd} DEL), CLEAR, ANS (2^{nd} (-)) and ENTRY (2^{nd} ENTER).
   a) Play with these buttons and other ones to get comfortable with using your gc as a calculator
   b) Your calculator always uses PEMDAS (order of operations) so you need to be careful in what you are putting in. How can you get your calculator to do $\frac{567+2748}{132}$?

2. Graphing: Graphing formulas will be a major activity with your gc. A graph can tell you lots of key information if you know how to interpret it. Once a formula (we will call them functions soon) is graphed, we can use it to solve equations and inequalities (we learn to solve these by hand in the rest of this chapter). We can do lots of other things with a formula once it is graphed.
   a) Hit Y= and put in the expression $x^2-3x-10$ for Y_1. Hit ZOOM and then #6, ZSTANDARD. This sets the "standard" window which is –10 by 10 for both *x* and *y*. You now see the graph of $y=x^2-3x-10$.
   b) Hit TRACE and then move left/right on the curve. This is a nice feature but is of limited use because we cannot control exactly what points we see. We will learn some better tricks.
   c) Hit CALC (2^{nd} TRACE) to get the "calculate" menu. This has lots of good tools that we will use this year. Choose #1, VALUE. Give it an *x* value (hit ENTER afterwards). What did your gc do? Hint: you must pick an *x*-value that is in your window. Try one outside of your window.
   c) We can use the ZERO button on the same CALCULATE menu to solve $x^2-3x-10=0$. It is a quadratic so we know it has two solutions. Looking at our graph we can see two *x*-intercepts or two zeroes (*x* values that give a *y* of zero). After hitting ZERO you will be asked for a left bound, right bound and a guess. You need to tell your calculator where to look for the zero and a starting place. You can type in the info or move left or right to the location (typing is faster). Use the ZERO command twice to find both zeroes. Solve the equation by factoring to verify your answers.
   d) We can also use our calculator to solve inequalities. This requires looking at the graph and doing a little thinking. Lets try to solve $x^2-3x-10>0$. Look at the graph of $y=x^2-3x-10$. We have just determined where this graph hits zero. Where is the graph greater than 0? (in other words, for what *x* values is the graph above the *x*-axis?) Write your answer using an inequality or interval notation (we learned that stuff for moments just like this)
   d) Look at the graph of $y=x^2-3x-10$ and use it to solve $x^2-3x-10\le 0$. We will learn to do this by hand in 1-6.

3. Lets use our calculator to solve $2^x=7$. (we will learn how to do this by hand in ch 5). There are two ways to solve this.
   a) First lets solve it like we solved the last equation. $2^x=7$ is the same as $2^x-7=0$ so we can graph $y=2^x-7$ and find its zero. Before you do it, take a guess at about what the solution should be.

b) A second way to solve the equation is to graph $Y_1 = 2^x$ and $Y_2 = 7$ and then find where these two meet using the INTERSECT command off the CALCULATE menu. You will need to choose which two curves to look at and give a guess. Solve the equation this way now.

4. Making a Table: Sometimes a table of values is more helpful than a graph. See p. 57 #98 for an example.
   a) First put in the formula using the Y= screen. (you need parenthesis around the numerator) Then go to TBLSET (2^{nd} WINDOW). You can choose to make a table systematically by setting your first x value (TBLSTART) and how far between x's (ΔTBL). You see the table by hitting TABLE (2^{nd} WINDOW). Experiment with this.
   b) To make the table needed in # 98, we need to use certain x values. You do this by going to TBLSET and setting INDPNT (x is the "independent variable) to ask. Then when you see the table you can input any x value you want and your gc will calculate the y that goes with it.

5. Use the table feature to do p. 57 # 99

6. Your calculator is a great tool but you need to understand what the results mean. If I tried to solve $x^2 + 4 = 0$ by graphing $y = x^2 + 4$, I would be in trouble. Try to do this and explain why the calculator can't help in this case. Explain what the answers are.

7. We have done some problems in the past where we look at the motion of an object that is launched up into the air. We are now going to use our graphing calculator to make our life easier. Give all answers to two decimal places.
   a) The height of a rocket launched upwards at an initial velocity of 53 $ft/\sec$ is given by the formula $h = -16t^2 + 53t$, where h is the height in feet and t is the time in seconds since the rocket was launched. Graph this formula by putting it into Y_1. You will need to adjust your window so that you can see the section of the graph that is of interest. After putting in the formula, go to WINDOW and set the Xmin at 0 and the Xmax at 4. This will allow us to see the graph for t values (which our calculator calls x's) between -1 and 4. To adjust the y (or h in our formula) part of the screen, push ZOOM and then scroll down to 0: ZOOMFIT. This choice automatically sets the y values so that we can see all of the graph for our chosen x values. Look at your graph. Hit WINDOW to see the y range of the graph.

   b) Use your calculator to find the times when the rocket is at a height of 35 feet. (Use a Y_2 and the intercept command, like in 3b)

   c) We know the rocket is on the ground at $t = 0$. Use the ZERO command to find the other time when it is on the ground.

   d) Find the time and height of the rocket when it is at its highest point. You can use the MAXIMUM command on the CALC menu to do this. You will need to give left and right bounds as well as a guess.

   e) How does the time of the maximum height relate to the times when the rocket is on the ground? Will this always be true for these types of graphs? Explain your answer.