Algebra 2 Graphing Calculator Instructions

Cursor (bug):

1. The cursor (bug) might not be visible within the window you are working. Look at the bottom of the screen, there will be an ordered pair to tell you where the cursor is located.
2. To move the cursor you will use the right and left arrows only. (Under the graph key)
3. Focus on the y-value of the cursor, a lot of the time it will tell you that it is too high or too low to see the cursor.

Window (to see all key features of the graph):

Practice: Change the window to fit the equation $y = 2x^3 + 12x^2 - 17$

1. Use **WINDOW** (2^{nd} gray key from the left at the top)
2. Only change "Xmin", "Xmax", "Ymin", "Ymax"
    a. Often times we only change the "Ymin", "Ymax"
3. Make sure that the "Xscl" (x scale) $= 1$ and "Yscl" (y scale) $= 1$
4. Make changes to the window until you can see all key features of the graph. You may edit the window as many times as you need.
5. To return to a window that is 10 x 10, use **ZOOM** (middle gray button at the top) and #6

Examples:

1. $y = 5\sqrt{x+9} - 15$

2. $y = -x^2 + 10x + 35$

How to find an intersection: **(Solving an equation)**

Practice: $4x - 12 = 20$

1. Enter the left side of the equation in y_1 and the right side in y_2.
2. Use an appropriate window to locate the intersection of the 2 equations.
3. Once able to see the intersection, use the **2nd** function (blue) and the gray **TRACE** button (4^{th} gray button from the left on top row) to get to the calculate menu.
4. Choose option #5 – intersect
5. At the top of the screen, you will see one of your equations. On the bottom it asks you if this is the first of the 2 equations you want to find the intersection of, move the cursor as close to the intersection point as possible. Hit **ENTER** to agree.

6. At the top of the screen, you will now see the second equation you entered. The bottom now asks if this is the second of the 2 equations you want to find the intersection of. Hit **ENTER** to agree.
7. You will be asked if you want to guess. Hit **ENTER** to bypass.
8. The solution for x is given: $x = 8$. The intersection is $(8, 20)$

Examples:

1. $(x+3)(x+5)(x+2) = 72$

2. $\frac{1}{x} + \frac{1}{8} + \frac{1}{6} = \frac{1}{2}$

How to find the vertex or relative max/min of a quadratic or higher order polynomial:

Practice: $y = x^2 - 4x - 5$

1. Go to **y =** and graph the equation.
   a. Use the x^2 button on the far left to get the exponent of 2 or the ∧ button, on the right side, with a 2
2. Once you have an appropriate window that allows you to see the max or min, use the **CALC** button (**2nd**, **TRACE**) and select either the max (#4) or min (#3) depending on which you are trying to find.
3. You should see a little 'bug' on the screen and the bottom of the screen will ask you to set a left bound. Move the bug by using the right and left arrow keys until it is to the left of the vertex. Then hit **ENTER**.
4. Now you will be asked to set the right bound. Use your arrow keys to move the 'bug' to the right of the vertex. Hit **ENTER**.
5. You should now see two arrows at the top of the screen pointing towards each other. Your max/min should be between these two arrows (obviously it may be higher or lower than the arrows). If it isn't, start over at step 2 to fix it.
6. You will be asked if you want to guess. Hit **ENTER** to bypass.
7. Your vertex (max/min) should be listed at the bottom. In this case $(2, -9)$.
8. The minimum of this function would be -9. (the y-value)

Examples: Find all max/min value

1. $y = -2x^2 + 8x + 15$

2. $y = x^4 - 9x^2 + x - 2$

How to find the y intercept: **(You may use this to find the y value given any x value)**

Practice: $y = 2(x-4)^2 + 15$

1. Find an appropriate window for the important features of your parabola (vertex, x-intercepts, y-intercept)
2. Press the **CALC** button (**2nd**, **TRACE**)
3. Select option #1 – value
4. An x = will appear at the bottom of the graph. Type in 0, then press **ENTER**.
5. The y – intercept should appear. y = 47
6. To find any other value of y given x, do the same. Type in $x = 14$. What does y =?
7. The calculator says error if your window isn't big enough – adjust your x max if necessary. Then try again. $y = 215$

Examples:

1. Given $y = \frac{1}{2}x^3 - 4x + 9$

a. Find the y-intercept: _____

b. Find the value of y when $x = -2$: _____

2. Given $y = \sqrt{2x+9} - 6$

a. Find the y-intercept: _____

b. Find the value of y when $x = 8$: _____

How to find the x-intercepts/zeros/roots:

Practice: $y = x^2 - 4x - 5$

1. Type equation into y = and find an appropriate window for the key features.
2. Since the x intercepts are on the x axis, when $y = 0$, we can find the intersection between our graph and the equation of the x-axis which is $y = 0$.
3. Your quadratic equation should be in y_1. Just enter 0 for y_2.
4. Press the **CALC** button (**2nd**, **TRACE**) and select option #5 intersect.
5. Move your curser (bug) so that it is fairly close to the left intercept (doesn't have to be on it, just close). Use the steps for finding the intersection above (hit **ENTER** 3 times to select 1st equation, 2nd equation and by-pass the guess). You should get $x = -1$.
6. Now repeat steps 3 and 4 for the right intercept. The second intercept is $x = 5$.
7. In a polynomial, sometimes you will have real as well as imaginary roots. You can find the number of imaginary roots by taking the degree minus the number of real roots. Finding the imaginary roots, however, must be done by hand (quadratic formula).

Examples: Find the real roots (x-intercepts) and # of imaginary roots (if any)

1. $y = x^3 - 5.5x^2 + 2.5x + 9$

2. $y = x^4 - 7x^3 + 13x^2 + x - 20$

3. $y = 2\sqrt{x + 9} - 8$

Table:

1. **2nd** **GRAPH** → **TABLE**
2. The table of values can be beneficial for finding (doesn't work all the time):
    a. X-intercept(s): look for when $y = 0$
    b. Y-intercept: look for when $x = 0$
    c. More points to plot to sketch a more accurate graph
    d. Starting point for a radical (where the ERROR's end)