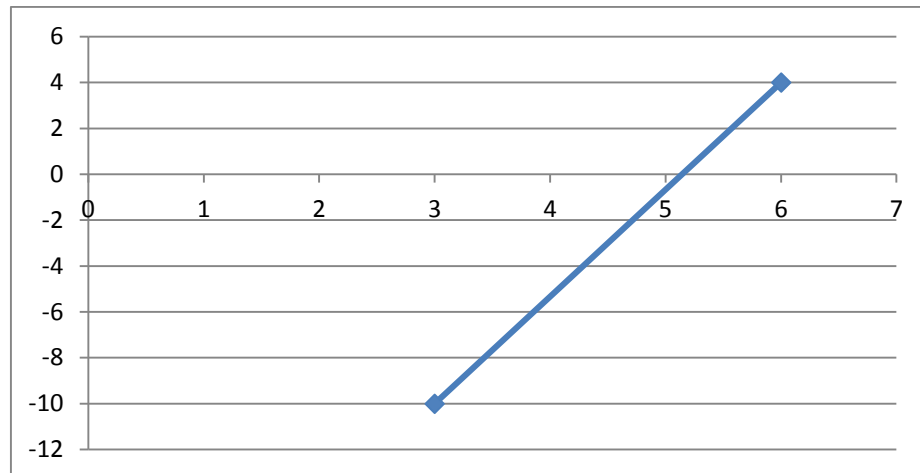**Week 3 Homework – CMSC405**

1. Given the 2 end points shown on the graph below, determine the slope, y-intercept and give the slope-intercept formula. Determine one additional point that would be on that line using the slope-intercept formula where the x value would be greater than 6.

Be sure to show your work.

2. Calculate the plane coefficients (A,B,C and D) of 3 points in a plane defined by P1, P2 and P3, and determine if the point P4 is behind or in front of the polygon surface contained within that plane:

P1 = (10,-20,40);
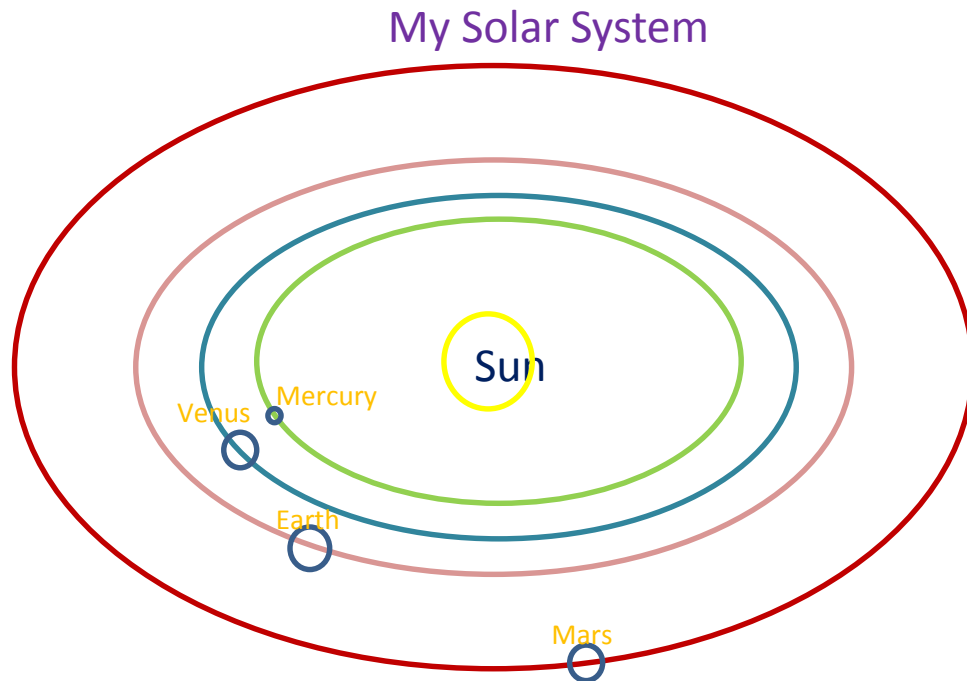P2 = (30,3,18);
P3 = (-5,-10,25);
P4 = (-10,12,-19);

Be sure to show your work. Explain why determining if Point P4 is behind or in front of the polygon surface relevant to computer graphics applications.

3. Using Visual C++ and your OpenGL configured environment, write an application that displays a graphical scene that displays a top-down, 2-D (non-animated) view of the Sun and at least 4 planets of our solar system. You can assume elliptical orbits for all of the planets in your scene. Sizes of the ellipses should be scaled to the actual distances from the Sun. You should include circles representing each of the planets and the Sun in your scene. Sizes of the objects should be scaled proportional to their actual size (with the exception of the Sun as it will be most likely too large to have other planet be visible). Be sure to label each of your planets and the Sun. In the word document you submit, describe exactly how you scaled your planets and elliptical orbits. Be sure to reference your source for planet size, and distance from the Sun. (e.g. http://www.solarviews.com/eng/solarsys.htm)

A "rough" graphics scene might look like this:

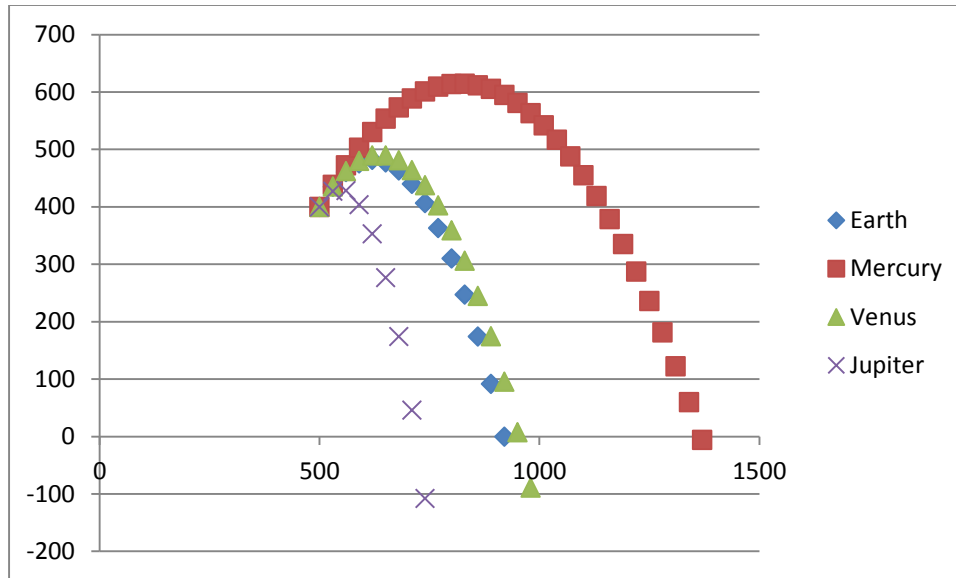My Solar System

Reference: http://www.solarviews.com/eng/solarsys.htm)

4. Using Visual C++ and your OpenGL configured environment, write an application that **calculates** and plots the 2D parabolic trajectories for an object whose starting position is p_1 = (500,400) with velocities, v = (30m/s,40 m/s), for at least 4 different planets including Earth. Plot the trajectories using different line colors and styles for values of time increments of 1 second. Plot the trajectories only up to the first negative Y value. For example, the last 3 plotted points (x,y) might be

860	174.4
890	91.9
920	-0.4

No additional points beyond the first negative value should be plotted.

Label the trajectories corresponding to the planets selected. Be sure to reference your source used for the gravity for the planets. Be sure your plot is well-organized, includes grid lines, x and y axis, x-axis and y-axis labels, and legends. Each trajectory should use a different symbol or shape or color. One possible graphic result is shown below.

Deliverables:

You should submit a well-organized, word document that includes the results for the math questions of along with a screen captures of the output of you running your Visual C++ code. In the word document be sure to include your analysis including exactly how you scaled your planets and elliptical orbits. You should also submit your C++ source code. Be sure to include all references used. You should name your word assignment "yournamehw3.doc" (or .docx, or .pdf). You should name your C++ source code yournamehw3_1.cpp and yournamehw3_2.cpp, respectively for your two C++ applications. Be sure to submit your homework in the assignments folder no later than the due date listed in the syllabus.

Hints:

1. Be sure you start with the CMSC405 C++ blank template. (Found in week 2 and week 3 source code)
2. Take advantage of the building block code found in week 2 and week 3 source code.
3. Use graph paper to sketch your Solar system and plotting area for your projectile motion.