This final mini project required student to utilize the ode45 function to simulate a 3-body orbiting spacecraft problem. My original time spent on the project was in lab during the ‘Numeric ODE Solutions’ Lab. We were introduced to the odeset and ode45 functions. I worked in collaboration with one of my partners in the previous project during our workshop and lab time. My research on the subject took an hour and a half. I utilized the Matlab HELP and looked into the Ordinary Differential Equations page. There was an Advanced Event Location example called ‘orbitode’ that was very similar to our project. It gave me a clear direction with the main function, though their helper function seemed much more advanced than what we were being asked for. The example traced the path of a spaceship traveling around the moon and returning to the earth. The project as a whole took me 4 hours to complete. I gained a full understanding of how a helper function can help solve a problem and how to model advanced event location problems.

Additional Questions:
- The period of the orbit given the initial conditions is 2.75 as seen in plot 1.
- The maximum y distance from earth given the initial conditions and rotating coordinate system is $2.7 \times 10^8$ m.
- The center of mass of the 3 body system at the center of the earth is $3.15 \times 10^6$ m.
- Experiment with other initial conditions.
  - Slightly adjusting the initial conditions can have a large impact on the orbit path. If the initial x or y conditions are too large, the orbit will be lost and uncontrolled. By changing the initial y velocity to -2, the shuttle hits the moon. If the initial y conditions are set to -1.75, the shuttle is very close to the earth at certain points. Adjusting the masses of the earth and moon also creates very interesting orbits.