AE 8148 Spacecraft Dynamics and Control
Assignment 3
Due: 5pm, April 1, 2021 (email pdf to instructor)

1. Find a polynomial to solve for the L_1 location in the Circular Restricted Three-Body Problem.

2. For the Earth-Moon system, the mass ratio is $\mu = 0.01213$. Find the coordinates of L_1. The MATLAB "roots" function may be useful.

3. Determine the Jacobi constant for L_1 for the Earth-Moon system.

4. Obtain the linearized equations of motion about L_1.

5. For the Earth-Moon system, compute the eigenvalues of the linearized dynamics, and find the stable and unstable manifolds for L_1. Include the Hill curves for the L_1 Jacobi constant on the same plot, to show that the stable and unstable manifolds do not cross them.

6. Using the center manifold for $L1$ as starting point, grow a family of (planar) Lyapunov orbits about $L1$. By examining the eigenvalues of the associated monodromy matrices, identify locations of bifurcation into new periodic orbit families. Using the eigenstructure of the monodromy matrices at the bifurcation locations, determine the directions in which the new families grow, and then grow those new families.