ASTR450 Homework # 6 – The N-Body and 3-Body Problems
Due Tuesday, March 18

Reading: Read Chapter 8.

1. Danby: Page 280, Problem 5.

2. Danby: Page 281, Problem 10.

3. Chapter 8. Rewrite Tisserand's Criterion so that it applies to i) parabolic-parabolic transitions and ii) parabolic-elliptical and parabolic-hyperbolic transitions. Answer the following questions using the approximations that i) the Tisserand Constant is exactly conserved and ii) Jupiter affects the comet only when it is very close to Jupiter. Can Jupiter put parabolic $i = 0$ comets onto circular uninclined orbits? Can a prograde parabolic ($i < 90°$) comet be perturbed onto a retrograde ($i > 90°$) parabolic orbit? Onto a retrograde elliptical or hyperbolic orbit?

4. Finish the six subroutines to translate between the mean anomaly M, the eccentric anomaly E, and the true anomaly ν for elliptic orbits. Find E and ν given $M = \pi/2$, $e = 0.8$. Write down an inequality relating the three anomalies over the pericenter to apocenter half of the orbit. How does this change for the apocenter to pericenter half? Please turn in a copy of your subroutine, with several example runs showing how you tested them.