AOE 4134 Astromechanics Problem Sheet 9

Due November 4, 2002

Read Chapter 4, Sections 4.1, 4.2, 4.6

40. A probe is sent to Jupiter using a Hohmann transfer orbit to get there.
    a) Find the time of the trip (one way). (TU_{sun} and in years, 365.25 days/year)
    b) Find the position r, and ν, at half the trip time.

41. A satellite is in an orbit the lies in the equatorial plane of the Earth. A ship at 150 deg W longitude observes the satellite directly over head and records its position and velocity as $\vec{r} = 1.2\,\hat{i}$ DU and $\vec{V} = 0.1\,\hat{i} + 1.0\,\hat{j}$ DU/TU. Later, another ship on the equator located at 130 deg W longitude observes the satellite directly overhead. Determine the time between sightings (neglect the rotation of the Earth). (TU, and in minutes)

42. A parabolic orbit is used to go to Jupiter with its perihelion tangent to Earth's heliocentric orbit. Determine:
    a) The time to travel to Jupiter (TU_{sun} , and in years).
    b) The position r, and ν, after half the trip time.

43. The same trip to Jupiter is now going to be done with a hyperbolic orbit. Assume the eccentricity of the hyperbolic orbit is 2.0 and that it is tangent to the Earth's orbit at perihelion.
    a) Find the time to travel to Jupiter (TU_{sun} , and in years)
    b) Find the position r, and ν after half the trip time.

44. The space station is in a 250 km circular orbit. A mechanic (wanting to get out of work) throws his wrench radially outward with a velocity of 50 m/s.
    a) Find the distance between the space station and the wrench after 30 minutes
    b) Will the mechanic ever be able to retrieve his wrench? Why or why not, show work.