AOE 4134 Astromechanics Problem Sheet 3

Due 18 September, 2002

Read Chapter 1 again (4^{th} time)

16. A parabolic orbit has a perigee distance of 400 km above the Earth's surface.
    a) Determine the angular momentum for this orbit (DU^2/TU)
    b) Determine the true anomaly when r = 2 DU
    c) Determine the flight path angle at r = 2 DU

17. A parabolic orbit is used to transfer a satellite from a circular orbit that has a radius of 1.1 DU to another circular orbit that has a radius of 6.6 DU. The transfer orbit is such that its perigee distance is the same as the inner orbit radius. This arrangement makes the parabolic orbit tangent to the inner circular orbit, and hence their velocities are aligned. To enter into the parabolic transfer orbit, all we need to do is to add some velocity ΔV to the circular orbit speed to match the parabolic orbit velocity at perigee and the satellite will enter into the parabolic orbit.
    a) Determine the required ΔV in DU/TU
    b) Determine the speed of the satellite when it reaches the outer (6.6DU) orbit
    c) Determine the flight path angle at the outer (6.6 DU) orbit
    d) Determine the orbital speed of the outer orbit
    e) Determine the ΔV required to put the satellite
        Note that the outer circular orbit and transfer orbit velocities are ***vectors*** and Must be treated as such when computing ΔV

18. A satellite is observed to have a radius of 1.16 DU and a speed of 1.7 DU/TU. These observations occur when the true anomaly is equal to 90 degrees.
    a) Find the eccentricity of the orbit.
    b) Find the perigee distance of the orbit (DU)

19. Problem 1.19, page 47, Bate, Mueller, and White.

20. Problem 1.8, page 45, Bate, Mueller, and White