AOE 4134 Homework 9
Due: Friday October 27, 2000 at beginning of class

1. Determine the required inclination of a satellite in a 400 km altitude sun-synchronous orbit.

2. A satellite is initially in low-Earth elliptical orbit with periapsis altitude 400 km, and apoapsis altitude 600 km. It must be transferred to a semisynchronous orbit (orbital period = 0.5 sidereal days) at the critical inclination $\dot{\omega} = 0$, with $\omega = 270°$, and eccentricity of $e = 0.707$. Assume that the satellite is already in the correct inclination, and that periapsis is at $\omega = 270°$.

   (a) Determine a and e for the initial orbit.

   (b) If the satellite remained in the initial orbit, how much would ω and Ω change per orbit due to the Earth's oblateness?

   (c) Using a Hohmann-like transfer, determine the Δv and the transfer time. Do this for a "periapsis-to-apoapsis" transfer and for an "apoapsis-to-periapsis" transfer and discuss the differences.

3. A satellite is initially in low-Earth orbit at 23° inclination with altitude 500 km, and must be transferred to a geostationary equatorial orbit.

   Compute the total Δv, assuming a Hohmann transfer, both with the plane change Δv *before* the perigee kick and with the plane change Δv *after* the apogee kick.