AOE 4134 Homework 8
Due: Monday October 23, 2000 at beginning of class

1. The following Two-Line Element set (TLE) is for the International Space Station.

   ```
   ISS (ZARYA)
   1 25544U 98067A   00275.59951216  .00109532  00000-0  12083-2 0  1349
   2 25544  51.5770 317.4465 0005383 278.1771 218.9951 15.62225569106622
   ```

   Determine the position and velocity vectors of this spacecraft at epoch and 10 orbital periods after epoch:

   (a) Using ideal two-body motion

   (b) Taking into account the effects of Earth oblateness ($J_2 = 0.001081$)

   Determine the error in kilometers between the subsatellite points for (a) and (b).

   You can find information about the TLE format at the following website:

   `http://celestrak.com/NORAD/documentation/tle-fmt.html`

2. A satellite is initially in low-Earth orbit with altitude 400 km, and must be transferred to a semisynchronous orbit (orbital period = 0.5 sidereal days).

   Assuming a Hohmann transfer, determine the Δv and the transfer time.

3. A satellite is initially in low-Earth orbit with altitude 400 km, and must be transferred to a semisynchronous orbit (orbital period = 0.5 sidereal days).

   Determine the Δv and the time of transfer required to transfer the between the two orbits using a transfer ellipse with semimajor axis $a = 17,144$ km and eccentricity $e = 0.61$.

   Compare these results with those of a Hohmann transfer.