Phys 410 – Homework #8

All problems from Taylor.

0) (zero points) Watch the three minute youtube video 'Transfer Orbits' (by Tal Schwartz) ; linked here and on the course website (not on ELMS). This short video illustrates how we can use elliptical orbits to transfer satellites from earth to the outer planets. The best route to take depends on whether you want to optimize for time or optimize for fuel.

1) 8.12 (a and b)
2) 8.14 (a, b, and c)
   - For (c), you don't need to sketch the orbits.
3) 8.18
4) 8.34

5) Extra Credit (3 pts) Examine the motion of a particle moving in an attractive central potential described by $F(r) = -k/(r^3)$, where k is a positive constant. (That's r-cubed in the denominator.) Discuss various cases depending on the value of k. For each case find the functional forms for $r(\phi)$, and sketch the effective potential and the shape of some of the valid orbits. Consider different values of the total energy. Can circular orbits exist? If they exist, are they stable?

Optional problems, for further study. If you attempt one of these, we will read your solution and give you written feedback. No extra credit. Solutions will be posted.

6) 8.9
7) 8.10
8) 8.19