AST 308, Homework Set 4

Due Monday, Oct. 26 at start of class.

1. The Andromeda Galaxy M31 is located 0.89 Mpc from us and is approaching the Milky Way with a radial velocity of -100 km s^{-1}. Suppose that this radial velocity represents the entire "peculiar" velocity (the velocity *not* due to the Hubble flow) of M31. How far away would a galaxy having the same peculiar velocity as M31 need to be so that if we used *only* that one galaxy to determine the Hubble constant, the error due to its peculiar velocity would cause an error of 5% in the derived value of H_o? Use the value of H_o found by the HST key project.
2. Do the following CO problems:

    29.7 Max size and lifetime of a closed universe.
    Hint: An approach for doing part (b) is to use the parametric solutions to the Friedmann eqn, found on [CO pg. 1156].
    29.9 Show that all universes are flat at small *t*.
    29.12 Derive the acceleration equation.
    Hint: you will need to use eqns: [29.10] and [29.50].
    29.21 Dipole anisotropy in CMB.
    Hint: There is a sneaky 180° difference between the zero points for the directions used in eqns [4.32] and [29.61].

I will (try to) remind you of each of the above CO problems as we reach the related material in the lectures. I recommend that you actually do each problem at the time we come to it in class. You could do Problem 1 right away.

Warning: In addition to the above homework assignment, I may also ask a few additional single homework questions one at a time, each of which will be due at the start of the next class meeting after the meeting in which it is asked. But they will be about General Relativity [Ch. 17] and material that we reach after that.