Ast/Phys 5022
Fall 2008
Problem Set #5 (due Nov 25/Dec 1)

1. The speed of sound changes during recombination. Because of that, the Jeans mass in baryons (mass corresponding to the Jeans length) changes dramatically as well. Write down expressions, and calculate the Jeans mass before and after recombination. State your assumptions.

2. The velocity of the Solar System with respect to the CMB is ~ 300 km/s. What is the contribution to the CMB temperature fluctuations of the quadrupole from this motion? Roughly, how does its magnitude compare to that of the observed CMB quadrupole?

3. Calculate the power spectrum $P(k) \propto k^n$ of fluctuations characteristic of white noise, i.e. a distribution of randomly scattering identical point masses. Calculate α and n spectral indexes. How does this compare to the Harrison-Zel'dovich power spectrum produced by inflation?