AST353 (Spring 2016) **ASTROPHYSICS Group Project 1: Primordial Density Fluctuations** 15-min presentation/discussion: Thu/Fri, March 10-11, 2016 Written report due: Friday, March 11, 2016 (worth 15/100)

You should work on all components of this project in close collaboration with your team (Groups A - I). Your group is expected to get stuck occasionally, at which point you should not hesitate to ask the TA or the professor for help.

I will test your understanding in a short (15-min) meeting with the individual groups. In the beginning (first 10 mins), you will give a brief presentation (powerpoint, say), explaining your results and answers, also placing them in a bit of context. I will then follow-up with questions.

1. Harrison-Zeldovich Spectrum

After the epoch of inflation, the universe is seeded with random perturbations that closely follow a *Harrison-Zeldovich* power spectrum $P_{\rm HZ}(k)$, where k is the so-called wavenumber.

Briefly explain what the HZ spectrum is!

The HZ spectrum is said to be "scale free" (or "scale-invariant"). What does that mean?

2. Initial Density Fluctuations

(Numerically) evaluate equation (3.7) in the Loeb book, to reproduce the z = 0 line in Loeb's Figure 3.1. Attach a print-out of the code used. You don't have to reproduce the line 100%, just try to get close.