Build a computer code in the programming environment of your choice that starts from a given linear fluctuation spectrum, and computes the trajectories of at least 64,000 particles, contained in a periodic 3D box of 512 $h^{-1}$ Mpc on a side.

(1) Use the techniques discussed in class to generate the appropriate random numbers for the Fourier amplitudes then use FFT to compute the potential over a regular grid. Start at an initial redshift of 100. You will need to scale back the fluctuation spectrum by the appropriate growth factor (they are scaled to z=0). For this estimation use a Universe with $\Omega_m=0.35$, $\Omega_\Lambda=0.65$.

(2) Place the particles to their initial Lagrangian position (either on a regular grid or slightly randomized within cells).

(3) Compute the displacement vector at each particle’s position.

(4) Advance each particle to a redshift of 5, 2, 1 and 0.

(5) Take a 32 $h^{-1}$ Mpc tall slice (say in the x-y plane) of the simulation at each of these four redshifts and plot the positions of the points.

(6) Use both power spectra (pkbao.txt with the BAO wiggles, and nowiggles.txt for a smooth spectrum). Both files are located in the same directory as this document (http://www.sdss.jhu.edu/~szalay/class/2009/)

(7)

(8) Comment on the outcome, on what you say about the structure.