

# Homework 1, due 9/15/04

1. The luminosity function of galaxies (number of galaxies per unit volume per unit luminosity) can be crudely approximated by

$$\phi(L) \propto \begin{cases} L^{-1} & \text{for } L < L_* \\ 0 & \text{for } L > L_* \end{cases} .$$

- Calculate the distribution function in distance of a flux-limited sample of galaxies distributed homogeneously in space.
  - What is the mean luminosity of the galaxies in the sample as a function of distance?
  - Plot the results of a. and b. You may need to do some computations numerically.
2. The deceleration parameter is defined as

$$q = -\frac{R\ddot{R}}{\dot{R}^2} .$$

Show that, in a Friedman universe,

$$\Omega = 2q .$$

3. Show that in a Friedman universe,  $\Omega$  varies with the scale parameter as

$$\Omega = \frac{\Omega_0}{\Omega_0 + (1 - \Omega_0)R / R_0}$$