Homework 3

The number of galaxies per unit volume is described by the Schechter luminosity function:

$$\Phi(L) = \frac{\Phi_*}{L_*} \left(\frac{L}{L_*}\right)^{\alpha} \exp\left(-\frac{L}{L_*}\right) \tag{1}$$

• (a) For what values of α the number of galaxies is infinite?

• (b) Assuming that $\alpha = -1.25$, $\Phi_* = 0.02 \text{ Mpc}^{-3}$, and $M_{V,*} = -19.5$ find the average distance between galaxies brighter than L_* .

• (c) Assuming parameters in (b) and also the constant mass-to-light ratio $(M/L)_V = 30$, find the average density of mass in galaxies $\rho_{\rm gal}$ (in g/cm³). Compare this number with the critical density of the Universe $\rho_c = 3H^2/(8\pi G)$. $(H = 70 \,\mathrm{km/s/Mpc})$