Homework 1

Problem 1. In a FLRW flat cosmology, the angular diameter distance d_A of a galaxy at redshift z can be expressed as follows:

$$d_A = \frac{1}{1+z}\int_0^z \frac{dz'}{H(z')}. \tag{1}$$

Show a derivation of the expression above.

Problem 2. Compute the space-space component of the Ricci tensor, R_{ij}, for a FLRW metric.

Problem 3. Calculate the age of the Universe today for a matter dominated Universe in a flat FLRW metric ($\Omega_m = 1$, $\Omega_\Lambda = \Omega_r = 0$). Assume $H_0 = 70\,\mathrm{km\,s^{-1}\,Mpc^{-1}}$.