Cosmology 1

2023/2024
Prof. Pierluigi Monaco

Proposed problem, lecture 12
Topic: models with cosmological constant.

Consider the following FRW models:

- EdS05: $h = 0.5$, $\Omega_m = 1$, $\Omega_k = 0$, $\Omega_\Lambda = 0$;
- EdS07: $h = 0.7$, $\Omega_m = 1$, $\Omega_k = 0$, $\Omega_\Lambda = 0$;
- Open: $h = 0.7$, $\Omega_m = 0.3$, $\Omega_k = 0.7$, $\Omega_\Lambda = 0$;
- Lambda: $h = 0.7$, $\Omega_m = 0.3$, $\Omega_k = 0$, $\Omega_\Lambda = 0.7$.

(a) Plot the evolution of the scale factor $a(t)$ for the four models, so as the points at $a(t_0) = 1$ coincide.

(b) In the 90's the oldest globular cluster might have had an age of $t_{\rm gc} = 15.5 \pm 1.9$ Gyr. What of the four models above would be consistent with this evidence?

(c) In the Open and Lambda models, at what value of scale factor a and redshift z do we have the transition from matter-dominated to curvature- or Λ-dominated phases?