

1 Problem 1: Conformal Time and Horizons

- Assume the universe today is flat with both matter (Ω_m) and a cosmological constant (Ω_Λ). (a) Compute the conformal age or horizon of the universe and plot your result for $H_0\eta_0$ as a function of Ω_m . [numerically integrate for a few values and sketch the behavior] (b) What is the current horizon size for a universe with $\Omega_m = 1/3$ and $h = 1/\sqrt{2}$? (c) What is the mass contained within the current horizon in solar masses. If all objects were $10^{13}h^{-1} M_\odot$ in mass, how many are in the observable universe.
- Evaluate the conformal age as a function of the scale factor in the above cosmology. What happens when $a \rightarrow \infty$. Comment on the implications for establishing causal contact between observers currently separated by much more than a Hubble length.