UNIVERSITY OF CALIFORNIA, SANTA BARBARA
Department of Physics
2014 Winter Quarter

GALAXIES AND COSMOLOGY   Professor Treu

HOMEWORK #4
MULTI COMPONENT UNIVERSES

Problem 1: **Lookback Time - Redshift Relation:**
Be t_e the cosmic time at which radiation is emitted. The most distant galaxies known are observed at a redshift of $z \sim 7.5$. For a source at $z = 7.5$, compute t_e in the case of i) a nearly empty (e.g. CMB only), flat universe with no dark energy; ii) the concordance universe; iii) the Einstein-de Sitter model. Assume H_0=70 km s^{-1} Mpc^{-1}. Compare (in words) the time available to assemble the earliest observed galaxies in the three models.

Problem 2: **Pulling an Einstein:**
Ryden 6.4

Problem 3: **Evolution of redshift with time. Is it measurable?**
Ryden 5.3

Problem 4: **"Quintessence"**
Ryden 6.3