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

GALAXIES AND COSMOLOGY   Professor Treu

HOMEWORK #3
SINGLE COMPONENT UNIVERSES

Problem 1: **Scales relevant for Λ**
   Ryden, Problem 4.1. What about the Galaxy? (size = 10 kpc, mass = $10^{11} M_\odot$)

Problem 2: **Cosmic annhilation**
   Ryden, Problem 4.2.

Problem 3: **Redshift and w**
   Ryden, Problem 5.2.

Problem 4: **Cosmic time and redshift**
   Compute and plot cosmic time t as a function of redshift z for single component universes, adopting H_0=70 km/s/Mpc. For
   1) Curvature only
   2) Flat with $w = -1$
   3) Flat with $w = -2/3$
   4) Flat with $w = 0$
   5) Flat with $w = 1/3$
   Which ones are consistent with the age of the oldest stars?
   Plot the expansion factor a as a function of t/t_0 for the same models, extending the plot into the future. Discuss the various scenarios.