

ASTR 425 - Cosmology

Problem Set 1

Due: Jan 17, 2007

1. Calculate the distance at which the optical depth of uniformly distributed stars is unity, that is, the distance at which it becomes likely that a random line of sight intersects the surface of a star. A universe of this size would therefore violate Olbers' paradox. At what size Universe does the night sky become as bright as day? (You may assume all stars have the same size and temperature and, therefore, luminosity as the Sun). See problem 2.2 in Ryden for some details.
2. Use a simple argument based on M_{\odot}, L_{\odot} and the energy efficiency of nuclear fusion (0.7%) to estimate the Sun's lifetime. Review the steps needed to determine the age of a globular cluster (see any Astronomy 101 text). Now imagine that the distance to the globular cluster was miscalculated by (say) a factor of two. How does that change the calculated age? A miscalculation of distance will also affect H_0 . How does this change the calculated age of the Universe?
3. Ryden problem 3.2