

Problem Set 2

(due: 5:00 pm on Wednesday, May 10, 2006)

Note the change of due date from Monday to Wednesday

Do the following problems from *Introduction to Cosmology*, Barbara Ryden, Addison-Wesley:

Chapter 5: Problems 5.2, 5.3, 5.4

Chapter 6: Problems 6.1, 6.3, 6.4, 6.6, 6.8

Do the following problem:

Recent measurements indicate that the matter density parameter at the current epoch is $\Omega_{m,0} = 0.26$, the vacuum energy density parameter is $\Omega_{\Lambda,0} = 0.74$, and $H_0 = 70 \text{ km s}^{-1} \text{ Mpc}^{-1}$.

- (a) Determine the redshift at which the matter energy density and the vacuum energy density are equal.
- (b) We know that if these parameters are correct then our universe will re-enter a period of exponential expansion at some future time. Calculate the e-folding time of $a(t)$ during this future inflationary epoch.
- (c) Derive an expression for the maximum co-moving size that our particle horizon will attain. Compute the present day size (in Mpc) of this region.