

Astronomy 312 - Fragile

Homework 8 (assigned 3/24/16; due 4/5/16)

- (3) 1. (a) Show that Eq. (29.40) results from Eqs. (29.4) and (29.31).
- (2) (b) Find the current ( $z = 0$ ) age of the universe in units of the Hubble time.
- (2) (c) Translate the time in part (b) from units of Hubble time to Gyrs (use  $[h] = 0.70$ ).
- (2) (d) How does the age of the flat universe compare to the currently accepted age of 13.7 Gyrs? How does it compare to the oldest known globular cluster ages of about 11.5 Gyrs? Explain why the flat universe model yields an age that is of the same order of magnitude as the accepted age and the globular cluster ages.
- (4) 2. Show by substitution that Eqs. (29.36) and (29.38) are solutions to Eq. (29.11) for an open universe ( $k < 0$ ).
- (3) 3. Carbon absorption lines that are formed when the light from a distant quasar, Q1331+70, passes through an intergalactic cloud have been measured. The relative strengths of the lines indicate that the temperature of the cloud is  $7.4 \pm 0.8$  K, and the lines show a redshift of  $z = 1.776$ . How does the temperature of the cloud compare with the temperature of the CMB at that redshift? (If there are sources of heating for the cloud in addition to the CMB, the its temperature must be considered as an *upper limit* to the temperature of the CMB.)