ASTR121 Homework #11 – (Hamilton)
due Thursday May 8 (15 Points)

Finishing reading Chapter 25. These problems are from that chapter.

26. When we observe a quasar with redshift $z = 0.75$, how far into its past are we looking? If we could see that quasar as it really is right now (that is, if the light from the quasar could somehow reach us instantaneously), would it still look like a quasar? Explain why or why not.

35. (a) Calculate the maximum luminosity that could be generated by accretion onto a black hole of 3.7×10^6 solar masses. (This is the size of the black hole found at the center of the Milky Way, as described in Section 25-6.) Compare this to the total luminosity of the Milky Way, about $2.5 \times 10^{10} L_\odot$. (b) Speculate on what we might see if the center of our Galaxy became an active galactic nucleus with the luminosity you calculated in (a).

Now finishing reading Chapter 26 and try these problems.

35. Estimate the age of the universe for a Hubble constant of (a) 50 km/s/Mpc, (b) 75 km/s/Mpc, and (c) 100 km/s/Mpc. On the basis of your answers, explain how the ages of globular clusters could be used to place a limit on the maximum value of the Hubble constant.

41. Calculate the mass density of radiation (ρ_{rad}) in each of the following situations, and explain whether each situation is matter-dominated or radiation-dominated: (a) the photosphere of the Sun ($T = 5800$ K, $\rho_m = 3 \times 10^{-4}$ kg/m^3); (b) the center of the Sun ($T = 1.55 \times 10^7$ K, $\rho_m = 1.6 \times 10^5$ kg/m^3); (c) the solar corona ($T = 2 \times 10^6$ K, $\rho_m = 5 \times 10^{-13}$ kg/m^3).

Must keep reading! You'll need Chapter 27 for these problems.

29. How long can a proton-antiproton pair exist without violating the principle of the conservation of mass?

30. The mass of the intermediate vector boson W^+ (and of its antiparticle, the W^-) is 85.6 times the mass of the proton. The weak nuclear force involves the exchange of the W^+ and the W^- . (a) Find the rest energy of the W^+. Give your answer in GeV. (b) Find the threshold temperature for the W^+ and W^-. (c) From Figure 27-6, how long after the Big Bang did W^+ and W^- particles begin to disappear from the universe? Explain.

Congrats!! You are done with the last ASTR121 Homework EVER!! :)