

Astronomy 312 - Fragile

Homework 7 (assigned 3/17/16; due 3/24/16)

- (3) 1. (a) Plot the angular diameter vs. distance (in Mpc) for a galaxy with a linear diameter of 30,000 pc. At what distance does the galaxy subtend an angular diameter of $\delta = 4$ arcsec (about the smallest angular size at which a galaxy could still be classified)?
- (2) (b) Using the information from part (a), discuss our ability to classify accurately the morphologies of galaxies at distances of 10 Mpc, 100 Mpc, and 1000 Mpc (1 Gpc). Assume 1 arcsec resolution data.
2. The Virgo cluster contains a large amount of hot (70 million K) intracluster gas that emits X-rays.
- (4) (a) If the X-ray luminosity of the intracluster gas is about 1.5×10^{36} W, find the electron number density and the mass of the gas. Assume that the Virgo cluster is a sphere of radius 1.5 Mpc that is filled with completely ionized hydrogen.
- (3) (b) Use $L_V = 1.2 \times 10^{12} L_\odot$ for the visual luminosity of the Virgo cluster to estimate the cluster's luminous mass. How does this compare with your answer to part (a) for the mass of the intracluster gas?
- (3) (c) Assuming that the gas has no energy source and is losing energy via thermal bremsstrahlung, estimate how long it will take for the gas to lose all of its energy. (Assume that the X-ray luminosity remains fixed.) How does your answer compare with the Hubble time, t_H ?