

Phys 126 Homework 1 (Due FRI April 6, 2:10pm)

Reading: Chapters 1-3

The cosmic expansion obeys

$$v = Hr$$

where $H_0 = 70 \text{ km/s/Mpc}$.

- 1.1) Using equation at what distance r is an object receding at a waking pace? Give your answer in a) meters, b) lightyears and c) megaparsecs.
- 1.2) Using equation at what distance r is an object receding at a speed equal to the speed of the sun moving around our galaxy? Give your answer in a) meters, b) lightyears and c) megaparsecs. *Hint: You will need to figure out this speed somehow. If do not have enough information, Google can be useful here!*
- 1.3) Using equation at what distance r is an object receding at the speed of light? Give your answer in a) meters, b) lightyears and c) megaparsecs.
- 1.4) H_0^{-1} has units of time. Convert the given value to a) seconds and b) years.
- 1.5) The equation $H^2 = \frac{8\pi G}{3} \rho$ relates values of H to values of mass density ρ . a) Use this expression to “convert” the above value of H_0 to a mass density ρ_0 . b) Compare ρ_0 to the density of the earth. c) Compare ρ_0 to the density of the solar system.