PHYS 200: Problem Set VIII

Due: 4:30 pm April 5, 2005

1. [3] The largest telescopes can just detect objects whose apparent brightness is on the order of 10^{-18} W/m^2. How far away could our sun be and still be detectable telescopically? The rate of energy reaching the Earth from the Sun is about 1.3×10^3 W/m^2.

2. [6] Estimate the observed wavelength for the 656 nm line in the Balmer series of hydrogen in the spectrum of a galaxy whose distance from us is (a) 1.0×10^6 ly, (b) 1.0×10^8 ly, and (c) 1.0×10^{10} ly

3. [6] Estimate what neutrino rest mass (in eV) would provide the critical density to close the universe. Assume the neutrino density is, like photons, about 10^9 times that of nucleons, and that nucleons make up only (a) 2% of the mass needed, or (b) 5% of the mass needed.