**(AST 461) Problem Set 2**

**1.** Rybicki and Lightman Problem 3.1

**2.** Rybicki and Lightman Problem 3.6

**3.** Rybicki and Lightman Problem 4.7

**4.** Rybicki and Lightman Problem 4.12

**5.** Rybicki and Lightman Problem 4.13

**6.** (for chapter 5) The Coma cluster X-ray source has a luminosity in the 2-10keV band of $5 \times 10^{44}$ erg/s a temperature, (from the X-ray spectrum) of $T = 10^8$K and a radius of $2 \times 10^{24}$ cm. Assuming a uniform matter distribution, compute the electron density, the mass of the X-ray emitting plasma (assuming an electron-proton plasma), its thermal energy content and its cooling time.

**7.** (for chapter 5) Consider an HII region (ionized hydrogen plasma) surround a hot star (this is called a Strömgren Sphere) with size L, electron density $n_e$ and temperature $T$. Calculate and sketch the specific intensity for bremsstrahlung emission/absorption as a function of frequency (hint: use the radiative transfer equation and emission and absorption coeffic. for bremst.). Explain how a measurement of the frequency at which the optical depth goes to 1, might be able to reveal the electron density.