Assignment 7

1. Derive an expression for the Rosseland mean opacity for free-free (Bremsstrahlung) absorption, and obtain its temperature and density dependence.

2. In the interior of the sun, at a radius equal to half the solar radius, the density is about 3 g/cm^3 and the temperature is about $10^{6.6}$ K. About 90% of the mass of the sun, including all nuclear energy sources, is located inside this radius. Assuming that the energy transport is mainly by radiative diffusion and that thermal bremsstrahlung provides the main source of opacity, estimate the temperature scale height at this point. From hydrostatic equilibrium obtain the pressure scale height, and hence the temperature gradient ∇_{rad}. Is this region stable against convection? Discuss.