4. **First excited state of Bose gas**

Find the occupancy of the first excited state of a bose gas and find whether there is macroscopic occupation below some temperature.

5. **Photons in a box**

Find the density of states $D(\omega)$ of a gas of photons in a black box of volume $V$ and the filling $n(\omega)$ of each level at frequency $\omega$. What is the chemical potential of a photon? (Hint: photon number is related to the condition on equilibrium between the photon gas and the box).

6. **Fermion degeneracy in white dwarves**

Write down the equation for the hydrostatic equilibrium of a white dwarf:

$$\frac{dP}{dr} = -\frac{GM(r)\rho}{r^2}.$$  

You can assume that the white dwarf is composed of relativistic, degenerate electrons with dispersion $\varepsilon = pc$. 