Physics 213 **Discussion Notes** **Week 5**

This week you will look at various applications of the Boltzmann distribution and the Stefan-Boltzmann law. With the Boltzmann distribution you will calculate average energies and probabilities to find the system in a particular configuration. We compute the average energy by evaluating

$$\langle E \rangle = \sum_{n=0}^{\infty} E_n P_n .$$

Sometimes there are several "degenerate" states with the same energy. We still count each individual state once.

To calculate the probability of a particular configuration, sum the probabilities of all the states that contribute to that configuration. Roughly, that's the number of states times the probability a typical state is occupied, if the probabilities don't vary too much.

The Stefan-Boltzmann law, $J = \sigma_{\mathrm{SB}} T^4$, allows calculation of the power radiated per unit surface area of a perfect radiator. We will use this in these problems to compute properties of stellar objects (suns, planets). It is impressive the accuracy that can be achieved in these calculations with physics you learn in 213!