Physics 3410 Homework #11

3 problems

Due by Monday, April 25th

▷ **1.**

Consider a system of fermions at $T = 300\,\mathrm{K}$. What is the probability that an energy microstate is occupied, if its energy is $0.03\,\mathrm{eV}$ above μ?

▷ **2.**

Consider a system of bosons at $T = 250\,\mathrm{K}$. Consider an energy microstate with energy $0.03\,\mathrm{eV}$ above μ.

(a) How many particles would you expect to find in this microstate, on average?

(b) What is the probability that exactly two particles are in this microstate?

▷ **3.**

Consider a system of two particles. Each particle can be in one of three possible microstates: one ground state ($E = 0$) and two excited states (both with $E = \mathcal{E}$).

(a) List the possible states that this system can be in if both particles are bosons. (For example, one such state has both particles in the ground state.) Then write the *partition function* Z of this system as a function of β.

(b) Now do the same thing if the particles are *fermions*.