Physics 603   **HOMEWORK ASSIGNMENT #4**   Spring 2014

Due date for problems: Tuesday, Feb. 25 [deadline on Feb. 27].

1. (5) PB 3.6, part c: Deriving the grand canonical distribution from the maximum entropy principle. (Parts a and b, for the microcanonical and canonical distributions, follow rather trivially.) [PB stands for Pathria and Beale]

2. (10) PB 3.15 Extreme relativistic version of the classical partition function and the resulting thermodynamic variables.

3. (10) PB 3.35 a. First show that $Z_1 = (V/\lambda_T^3) Z_{int}$ and find Z_{int}. Regarding the thermodynamics, just find the net dipole moment of the system and thence the polarization and dielectric constant.

4. (10) PB 3.42 Start by finding the number of up and of down spins.

5. (5) Consider $p(x) = (2/\pi)\sqrt{(1-x^2)}$ for $|x| < 1$ and 0 otherwise. Find the characteristic function (it involves a Bessel function) and then the first 4 moments and the first 4 cumulants. You are welcome to use Mathematica or tables to do expansions.

Students interested in the connection to Shannon entropy should consider problem PB 3.44