Phys 119A

Due: Friday, Nov. 19 at the beginning of class.

READING: SCHROEDER: CHAPTER 3.5, 5.1, 5.2 CARTER: CHAPTER 8, 9.1

BOOK PROBLEMS:

SCHROEDER: 3.36, 3.37, 5.5, 5.6, 5.16

CARTER: 8.3, 8.4, 9.1, 9.2

ADDITIONAL PROBLEMS:

1) Massieu functions are Legendre transforms of entropy in the same sense that the thermodynamic potentials are Legendre transforms of energy, U. Starting from the expression for the total differential of entropy $dS = \frac{1}{T}dU + \frac{P}{T}dV - \frac{\mu}{T}dN$, write down expressions for Massieu functions that are natural functions of the following variables: S'([1/T],V,N) S''([1/T],[P/T],N) $S'''([1/T],V,[\mu/T])$

Also, write down expressions for the total differential for each of these in terms of variations in its natural variables.

2) Derive the fact that the Helmholtz free energy is minimized (just show that dA=0, don't worry about proving that it is not a maximum or saddle) at equilibrium by the choice of internal system variables that minimizes A under conditions of constant (T,V,N). Your starting point should be the energy minimum principle discussed in class.