Physics 418
Homework 1 - Due Feb. 1, 2010

Exercise 1: Callen, 2.2-6.

Exercise 2: Study Callen section 3-6 as an example of a thermodynamic system. Do problems 3.6-1 and 3.6-2.

Exercise 3: Van der Waals gas. The equation of state is

$$P = \frac{k_B T}{v - b} - \frac{a}{v^2} \tag{1}$$

where a and b are constants. a models the strength of short-range interactions, while b models the excluded volume from the finite size of the atoms. Find (a) $T(u, v)$, (b) $s(u, v)$, and (c) use these results to eliminate a, b to find the hypersurface in the phase space (u, v, s, T, P) describing the family of van der Waals gases.