Physics 227
Homework 2 - Due Feb. 6, 2009

Problem 1: Callen, 3.7-3.

Problem 2: Callen, 4.6-2.
Put in numbers for a typical monthly heating bill. What if the outside temperature is 0°C?

Problem 3: Callen, 4.7-1.

Problem 4: Magnetic systems and Legendre transforms: Consider the fundamental equation of a simple paramagnetic model, given in Callen, Eq. (3.66). Recalling that magnetic moment is thermodynamically conjugate to magnetic field, (a) calculate the functions $B_e(S, I, N)$ and $T(S, I, N)$. (b) Calculate the "magnetic Gibbs potential" $\tilde{U}(T, B_e, N) = U - B_e I - TS$. (c) Show that it is possible to recover the original fundamental relation via inverse Legendre transforms.