Physics 831 Quiz #5 - Monday, Nov. 9

1. A two-dimensional lattice is made of coupled oscillators that are constrained to move only within the two-dimensional plane of the lattice. The oscillators have mass m, the speed of sound is c_s and the Debye frequency is ω_D.

   (a) At low temperature, the specific heat behaves at $C_V \sim T^\alpha$. What is α?

   (b) What is the specific heat per oscillator, $(1/N)dE/dT$, at high temperature? ($T >> \hbar\omega_D$)

#2 on back

2. (Extra Credit) Consider a mean field model of the Ising model where the mean spin is $\langle\sigma\rangle$, the coupling multiplied by the effective number of nearest neighbors is gJ, and the coupling to a magnetic field is $-\mu B\sigma_i$ for each spin. When the temperature is set exactly to T_c, $\langle\sigma\rangle$ behaves as B^η. Find η.