

## Phys. 807 — Statistical Mechanics

HW9 (due Tue Dec 6 at 4 p.m. in my mailbox).

1. Consider a two-dimensional electron gas in a magnetic field strong enough so that all particles can be accommodated in the lowest Landau level. Taking into account both orbital and spin paramagnetism, find the magnetization at absolute zero.
2. The energy levels of an atom with a magnetic moment  $\mu$  in the magnetic field  $B$  have the values

$$E_m = -mB\mu/j,$$

where  $j$  is a positive fixed integer number and  $m$  is an integer varying from  $-j$  to  $+j$ .

For  $n$  atoms per unit volume, find

(a) the magnetic moment  $M$  per unit volume of an ideal gas at the temperature  $T$  as a function of  $B$

and

(b) the susceptibility

$$\chi = \left. \frac{\partial M}{\partial B} \right|_{H=0}.$$