## PHYS455 Homework set X, Wednesday, March 30, 2005

(Due March April 6, 2005)

## The density of states, heat capacity and spin susceptibility of electron gases

1) (20)Derive the density of states of free electrons in 1, 2, 3 dimensions.

2) (10) Express the total energy of electron gases at a finite temperature T in terms of the density of states and Fermi distribution function. (Hint: Use the integral form.)

3) (10)Evaluate the heat capacity using the above formula. Show that it is a linear function of temperature at low temperatures.

4) (20) Consider electrons in an external magnetic field. Express the total magnetization at zero temperature in terms of the density of states. Calculate the spin susceptibility.