

Physics 831 - 2002

Statistical Physics

Problem Set 11

1. Consider two-dimensional (2D) gases of noninteracting fermions and bosons, with spin s and mass m . The density of the gas is $n = N/A$, where A is the area. Find the density of states (number of states per unit energy). Find the Fermi energy of the Fermi gas ε_F (4 pt). For the Fermi gas, find the equation of state and calculate the pressure for $T = 0$ (4 pt)
2. For the 2D systems described in the problem 1, find the equation of state for high-temperatures, to the lowest order in $n\lambda^2$. Find the first-order exchange correction for $\exp(\beta\mu) \ll 1$ (6 pt).
3. For an ideal 2D electron gas for $T = 0$, find magnetization as a function of a magnetic field (4 pt)
4. Problem 11.2, p. 277 (4 pt)

Problems with numbers are from Kerson Huang, *Statistical Mechanics*, 2nd edition, (Wiley, NY 1987).