Chapter 3
3.1 - 3.2

Robert Branson, Jason Surbrook

Consider a low density two-dimensional gas of non-relativistic spin ½ fermions of mass **m** at temperature **T** = 1/**β** and chemical potential **μ**.
In the context of the virial expansion:

$$P = \rho T \left[A_1 + \sum_{n=2}^{\infty} A_n \left(\frac{\rho}{\rho_0} \right)^{n-1} \right], \quad \rho_0 \equiv \frac{(2s+1)}{(2\pi\hbar)^3} \int d^3p \, e^{-\epsilon_p/T}$$

(a) Find ρ_0 in terms of **m** and **T**.
(b) Expand the density **ρ** to second order in exp(**βμ**). Express your answers to this part and the next two parts in terms of ρ_0.
(c) Expand ρ^2 to second order in exp(**βμ**).
(d) Expand **δP** = **P** - **ρT** to second order in exp(**βμ**). (Hint: ln(1+x) = x - ½x^2 + ….).
(e) Determine the second virial coefficient.