

In the name of God

Department of Physics  
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ADVANCED TOPICS IN STATISTICAL PHYSICS II

Exercise Set 3

(Date Due: 1395/12/25)

1. Show that for ideal fermion system we have:

$$\frac{PV}{NKT} = \sum_{\ell=1}^{\infty} (-1)^{\ell-1} a_{\ell} \left( \frac{\lambda^3}{g_s n} \right)^{\ell-1}$$

here  $a_1 = 1$ ,  $a_2 = -\frac{1}{4\sqrt{2}}$  and so on.

2. Show that for ideal fermion system we have:

$$C_V = \frac{3}{2} NK \sum_{\ell=1}^{\infty} (-1)^{\ell-1} \frac{5-3\ell}{2} a_{\ell} \left( \frac{\lambda^3}{g_s n} \right)^{\ell-1}$$

here  $a_1 = 1$ ,  $a_2 = -0.0884$  and so on.

3. Show that for ideal fermion system near zero temperature, we have:

$$kT \ln z = \mu \equiv \epsilon_f \left( 1 - \frac{\pi^2}{12} (kT/\epsilon_f)^2 \right)$$

Good luck, Movahed

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