Physics 410 - 2004

Thermal Physics

Problem Set 4

1. N molecules of an ideal gas (noninteracting material points) are placed in a container of volume V. Let a part of these molecules, n, occupy volume v. The system is in thermal equilibrium. (a) Find the probability distribution $P(n)$ and show that it is Gaussian for large $N, n, N-n$; (6pt) (b) Find $\langle n \rangle$ and $\langle (n - \langle n \rangle)^2 \rangle$ in this case (2 pt)

2. Chapter 3, p. 81, problem 1 (4 pt)

3. Chapter 3, p. 81, problem 2 (4 pt)

4. Chapter 3, p. 82, problem 3 (5 pt)

5. Chapter 3, p. 83, problem 4 (5 pt)

You need to have 23 points out of 26 (3 points are extra credit).

The problems are from Kittel & Kroemer, *Thermal Physics*, 2nd edition, (Freeman, NY 1980).