Physics 831 - 2002

Statistical Physics

Problem Set 13

1. Show that Bose-Einstein condensation does not occur in an ideal 2D Bose gas of nonrelativistic particles (6 pt)

2. Consider a system of two coupled oscillators, with coordinates $q_1, q_2$ amd momenta $p_1, p_2$ and the Hamiltonian

$$H = \frac{p_1^2}{2m} + \frac{p_2^2}{2m} + \frac{1}{2} \sum_{i,j=1,2} K_{ij} q_i q_j$$

where $K_{ij}$ is a positive definite $2 \times 2$ matrix. Show that this system can be reduced to two independent oscillators and find their eigenfrequencies. Suppose that the system is weakly coupled to a thermal bath. Find $\langle q_1^2 \rangle$. (8pt)