In the name of God

Department of Physics
Shahid Beheshti University

ADVANCED STATISTICAL MECHANICS I

Exercise Set 2

(Date Due: 1395/07/15)

1. For binomial distribution as:
$$P_k = \frac{N!}{k!(N-k)!} p^k q^{N-k}$$
   compute $\langle k \rangle$ and $\sigma_k^2 = \langle (k - \langle k \rangle)^2 \rangle$.
   Show that for $N \to \infty$ mention distribution will be a Gaussian PDF.

2. Making an ice during a night at desert. Examine the possibility of changing a plate of water to ice state in time interval between sunset till sunrise in a desert with naked dark sky.

3. Prove Gibbs-Duhem relation and interpret its meaning.

4. Chapter 1 from M. Kardar's Book: Q2, Q3, Q4, Q6

Good luck, Movahed