In the name of God

Department of Physics
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ADVANCED TOPICS IN STATISTICAL PHYSICS II

Exercise Set 8

(Date Due: 1393/02/20)

1. Computational program: In this activity, it is supposed that we investigate the position and variance of position for a random walk in 1D.

A : Write a computational program in which, $\langle x\rangle_N$, $\langle (x-\langle x\rangle)^2\rangle_N$ and $P_N(x)$ are computed. To this end suppose the probability of jumping forward and backward to be equal.

B : Do the same as part **A**, just suppose the probability of jumping forward is P_+, the probability for jumping backward is P_-.

C : Do the same as part **A**, just suppose the periodic boundary condition. Compare your results with previous part.

2. Write down the following tasks:

A : $P_s(s) = \frac{1}{2\ell}\exp\left(-\frac{|s|}{\ell}\right)$
Compute $\langle x\rangle_N$, $\langle (x-\langle x\rangle)^2\rangle_N$ and $P_N(x)$.What happens for $N\to\infty$.

B : $P_s(s) = \frac{1}{\pi}\frac{\ell}{s^2+\ell^2}$
Compute $\langle x\rangle_N$, $\langle (x-\langle x\rangle)^2\rangle_N$ and $P_N(x)$. What happens for $N\to\infty$.

Good luck, Movahed