

In the name of God

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ADVANCED METHODS ON COMPUTATIONAL PHYSICS

Exercise Set 7

(Date Due: 1399/01/31)

1. For random walk in  $1D$ , compute  $\langle x(N) \rangle$  and  $\sigma_N^2$  for following cases:
  - A: Suppose each steps coming form random variable with flat PDF.
  - B: Suppose the probability of step value is a gaussian and to be random, namely:  $P(s) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{s^2}{2\sigma^2}\right)$ .
  
2. Simulate a particle based on Langevin equation and then compute:
  - A:  $\langle v(t) \rangle$ .
  - B:  $\langle v(t)^2 \rangle$ .
  - C:  $\langle v(t_1)v(t_2) \rangle$ .
  - D:  $\langle x(t) \rangle$ .
  - E:  $\langle x(t)^2 \rangle$ .
  - F:  $\langle x(t_1)x(t_2) \rangle$ .
  - G:  $p(v)$ .
  - H: Compare all of above parts with theoretical predictions.
  - I:  $p(v(t); v(t + \tau))$ . What happens if  $\tau \rightarrow \infty$ .

Good luck, Movahed

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