Stochastic systems in statistical mechanics and randomly forced PDE's

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We present two results on the large-time asymptotics of Markov chains and apply them to prove :

(a) a classical result on the absence of phase transitions in a one-dimensional lattice gas ;

(b) the uniqueness of a stationary measure for some random dynamical systems associated with stochastic PDE's ;

(c) Harnack-type inequalities for the above systems.

We next turn to some open problems in the theory of stochastic PDE's and discuss their counterparts in statistical mechanics.

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