

PHYSICS 210B : NONEQUILIBRIUM STATISTICAL PHYSICS
HW ASSIGNMENT #5 : APPLICATIONS

(1) Consider the *gambler's ruin* problem in which two players A and B gamble repeatedly against each other by betting \$1 on each trial. The probability of A winning in any given trial is p . Assume A starts with n dollars and B with $N - n$ dollars, and that the game ends when one player runs out of money.

- (i) What is the probability that player A eventually wins?
- (ii) How long does the game last?
- (iii) Given that A wins, how long does the game last?

(2) Consider aggregation with the kernel $K_{ij} = \alpha(i + j)$.

- (i) Derive the dynamical system for the concentrations $c_n(t)$.
- (ii) Obtain and solve the rate equations for the first four moments $\nu_k(t) = \sum_{n=1}^{\infty} n^k c_n(t)$, assuming initial conditions $c_n(0) = \kappa \delta_{n,1}$.
- (iii) Assuming the same initial conditions, obtain the exact solution for $c_n(t)$.