Homework 2

Ma623 Stochastic Processes

due Tuesday Feb 7 2011

Please solve the following problems:

(1) **(Simulation problem)** Using your choice of computer program learn how to simulate a toss of a fair coin (1 with prob 0.5 and 0 with probability 0.5). Then:

   (a) At step i simulate a sequence of $2^{20} = 1,048,576$ tosses and let L_i be the length of the largest sequence of ones among these tosses.

   (b) Repeat the previous for $i \in \{1, 2, \ldots, 1000\}$ (1000 times) each time recording the corresponding L_i

   Make a histogram of the values obtained. Calculate the average of the values. According to exercises 8.6-8.10 what values should be close to this average? Does this happen in your little experiment?

(3) Let X_t be a homogeneous (regular) Poisson process with rate λ. Determine the covariance between X_t and X_{t+h} where $t, h > 0$. That is calculate:

$$\mathbf{E}\Big[\left(X_t - \mathbf{E}[X_t]\right) \left(X_{t+h} - \mathbf{E}[X_{t+h}]\right) \Big]$$

(4) Problem 9.5 from the notes

(5) Problem 9.6 from the notes

(6) Problem 9.7 from the notes

(7) Problem 9.9 from the notes

Simulation exercises: Problems 9.8 and 9.11 from the notes.

Bonus Problem: Problem 9.13

In addition, any problem not mentioned in this assignment and left as an exercise in the class will count as bonus points.