Homework 2
Ma623 Stochastic Processes
due Tuesday Feb 27 2006

For the first assignment please do exercises 2.6, 2.10, 2.13, 2.30, 2.33 from the notes handed in class.

In addition do the following simulation exercises:

(1) Using a software package simulate a Poisson process with rate 2 events/min. Using your simulation estimate the probabilities:

$$\mathbf{P}\{N_{[2,4]} = 4\}$$

$$\mathbf{P}\{S_3 \in [3,5]\},$$

where $N_{[2,4]}$ denotes the number of events in the time interval $[2,4]$ minutes, and S_3 is the time of the third event.

Calculate what these theoretical probabilities should be and see what was the difference between your simulated probabilities and the theoretical ones for $1,000$, $10,000$ and $100,000$ repetitions respectivelly.

(this is called a *Monte-Carlo* simulation approach).

(2) Using a software package simulate a Poisson process on the plane suitable for problem 2.33 above. Use $\lambda = 2$. With the help of this simulation answer the following questions:

(a) Estimate the probability that the circle of radius 1 centered in the origin of the plane contains two events.

(b) Estimate the probability in part (a) of the problem 2.33. Use the origin of the plane as the fixed point, and varying values for the distance t (say $t \in \{0.25, 0.5, 1, 2, 3, 4\}$). Use as many repetitions as you like.

(c) Do the same thing as in part (2) but for the distance $R_2 - R_1$, again with the R_i's defined in the problem 2.33.