Math 5040-1 final exam
Fall 2008

Instructions:

- This exam is due Thursday December 18, *to be returned in my mailbox only*. Late exams or other methods of returning the exam are not accepted.

- You may not discuss this exam with other persons; this includes other students in this course. Failure to do this will result in a zero in this exam; further action might also be taken in accord with the university bylaws. By taking this exam you are agreeing that this represents your work alone.

Problems:

1. (Theoretical problem) Suppose that the number of buses that arrive in a given bus depot follows a Poisson process with rate $\lambda = 4$ [in units, "buses per hour"]. Suppose we have observed 10 buses in the first two hours. What is the probability that 5 of those arrived in the first hour?

2. (Theoretical problem) Consider a simple random walk on $S := \{0\,, 1\,, 2\,, 3\,, 4\}$ with an absorbing barrier at 0. Consider the following payoff function:

$$f(k) = k^2 \qquad \text{for all } k \in S.$$

   Compute the optimal strategy if:

   (a) it costs nothing to play every time;

   (b) it costs 5 dollars to play every time.

3. (Simulation problem) Simulate an inhomogeneous Poisson process up to time $t = 10$, when the rate function is $\lambda(t) = (1 + t)^{-1}$.