Statistics 394, Problem Set 4

Wellner; 1/26/2000

Reading:	Kelly, Chapter 1, Section 1.4; Chapter 7, Sections 7.2, 7.3, and 7.4;
Optional Web Reading:	The Poisson Process at http://www.math.uah.edu/stat/poisson/index.html .
Due:	Wednesday, February 2, 2000.
Reminder:	Mid-Term Exam: Monday, February 7.

1. K 1.4, # 6; compare with the answers to 1.4, #5 from Problem Set 3.

2. K 1.4, # 7

3. K 1.4, # 13.

4. Customers arrive at a bank at a Poisson rate λ. Suppose two customers arrived during the first hour. What is the probability that:
(a) Both arrived during the first 20 minutes?
(b) at least one arrived during the first 20 minutes?

5. Cars cross a certain point in the highway in accordance with a Poisson process with rate $\nu = 3$ per minute. If al blindly runs across the highway, then what is the probability that he will be uninjured if the amount of time that it takes him to cross the road is s seconds? (Assume that if he is on the highway when a car passes by, then he will be injured.) Do it for $s = 2, 5, 10, 20$.

6. Suppose in the preceding problem that Al is agile enough to escape from a single car, but if he encounters two or more cars while attempting to cross the road, then he is injured. What is the probability that he will be unhurt if it takes him s seconds to cross? Do it for $s = 5, 10, 20, 30$.

7. Bonus Problem: Look at the Poisson Experiment at the Virtual Laboratories website:

   `http://www.math.uah.edu/stat/poisson/index.html .`

   (a) For $\nu = r = 1$, and $t = 2.5$, Verify the probabilities $P(N(2.5) = k)$ you see plotted in blue: for $k = 0, 1, 2$.
   (b) What is the relationship between these probabilities (for $k = 1, 2, \ldots$) and the probabilities $P(W_m > t)$ for $m = 1, 2, \ldots$ and appropriate t?