

**Recitation 15**  
**April 7, 2005**

1. An amateur criminal is contemplating shoplifting from a store. Police officers walk by the store according to a Poisson process of rate  $\lambda$  per minute. If at least two police officers walk by while the crime is in progress, the criminal will be caught.

If it takes the criminal  $t$  seconds to commit the crime, find the probability that the criminal will be caught.

2. Problem 5.8, on page 304 in the book.  
During rush hour, from 8 a.m. to 9 a.m., traffic accidents occur according to a Poisson process with a rate of 5 accidents per hour. Between 9 a.m. and 11 a.m., they occur as an independent Poisson process with a rate of 3 accidents per hour. What is the PMF of the total number of accidents between 8 a.m. and 11 a.m.?
3. Problem 5.13, on page 306 in the book.  
A service station handles jobs of two types, A and B. (Multiple jobs can be processed simultaneously.) Arrivals of the two job types are independent Poisson processes with parameters  $\lambda_A = 3$  and  $\lambda_B = 4$  per minute, respectively. Type A jobs stay in the service station for exactly one minute. Each type B job stays in the service station for a random but integer amount of time which is geometrically distributed, with mean equal to 2, and independent of everything else. The service station started operating at some random time in the remote past.
  - (a) What is the mean, variance, and PMF of the total number of jobs that arrive within a given three-minute interval?
  - (b) We are told that during a 10-minute interval, exactly 10 new jobs arrived. What is the probability that exactly 3 of them are of type A?
  - (c) At time 0, no job is present in the service station. What is the PMF of the number of type B jobs that arrive in the future, but before the first type A arrival?
  - (d) At time  $t = 0$ , there were exactly two type A jobs in the service station. What is the PDF of the time of the last (before time 0) type A arrival?
  - (e) At time 1, there was exactly one type B job in the service station. Find the distribution of the time until this type B job departs.