

## Math 350 - Homework 3

Due 2/12/2010

1. (Text, problem 25, page 37.) The bus will arrive at a time that is uniformly distributed between 8 and 8 : 30 A.M. If we arrive at 8 A.M., what is the probability that we will wait between 5 and 15 minutes?
2. (Text, problem 27, page 38.) Let  $X$  be a binomial random variable with parameters  $(n, p)$ . Explain why

$$P\left\{\frac{X - np}{\sqrt{np(1-p)}} \leq x\right\} \approx \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-x^2/2} dx.$$

3. (Text, problem 32, page 38.) For a Poisson process with rate  $\lambda$ , find  $P\{N(s) = k | N(t) = n\}$  when  $s < t$ .
4. (Text, problem 35, page 38.) An urn contains four white and six black balls. A random sample of size 4 is chosen. Let  $X$  denote the number of white balls in the sample. An additional ball is now selected from the remaining six balls in the urn. Let  $Y$  equal 1 if this ball is white and 0 if it is black. Find
  - (a)  $E[Y|X = 2]$ .
  - (b)  $E[X|Y = 1]$ .
  - (c)  $\text{Var}(Y|X = 0)$ .
  - (d)  $\text{Var}(X|Y = 1)$ .
5. (Text, problem 36, page 38.) If  $X$  and  $Y$  are independent and identically distributed exponential random variables, show that the conditional distribution of  $X$ , given that  $X + Y = t$ , is the uniform distribution on  $(0, t)$ .

**I plan to discuss some of these problems in class during the week. It will help a lot if you think about the problems before I comment on them.**