STAT 400 Fall 2011

Homework #4

(10 points)

(due Friday, September 23, by 3:00 p.m.)

No credit will be given without supporting work.

1. Suppose a discrete random variable X has the following probability distribution:

$$P(X = k) = \frac{(\ln 2)^k}{k!}, \quad k = 1, 2, 3, \ldots .$$

Recall (Homework #1 Problem 6): This is a valid probability distribution.

a) Find $\mu_X = E(X)$ by finding the sum of the infinite series.

b) Find the moment-generating function of X, $M_X(t)$.

c) Use $M_X(t)$ to find $\mu_X = E(X)$.

d) Find $\sigma_X^2 = \mathrm{Var}(X)$.

2. The number of typos made by a student follows Poisson distribution with the rate of 1.5 typos per page. Assume that the numbers of typos on different pages are independent.

a) Find the probability that there are at most 2 typos on a page.

b) Find the probability that there are exactly 10 typos in a 5-page paper.

c) Find the probability that there are exactly 2 typos on each page in a 5-page paper.

d) Find the probability that there is at least one page with no typos in a 5-page paper.

e) Find the probability that there are exactly two pages with no typos in a 5-page paper.

3. Suppose that the proportion of genetically modified (GMO) corn in a large shipment is 2%. Suppose 50 kernels are randomly and independently selected for testing.

a) Find the probability that exactly 2 of these 50 kernels are GMO corn.

b) Use Poisson approximation to find the probability that exactly 2 of these 50 kernels are GMO corn.

4. Tom takes a multiple choice quiz in his Anthropology 100 class.

a) The quiz has 10 questions; each has 4 possible answers, only one of which is correct. Tom did not study for the quiz, so he guesses independently on every question. What is the probability that Tom answers exactly 2 questions correctly?

b) The quiz consists of 10 questions; the first 4 are True-False, the last 6 are multiple choice questions with 4 possible answers each, only one of which is correct. Tom did not study for the quiz, so he guesses independently on each question. Find the probability that he answers exactly 2 questions correctly.

From the textbook:

2.4-4 (2.4-4 with $p = 0.40$) **2.4-12** (2.4-14) **2.4-18** (2.4-20)

2.5-2 **2.5-3** **2.5-4** **2.5-10**

2.6-2 **2.6-4**

3.3-2 (3.2-2) **3.3-4**(3.2-4)