

# MATH/STATS 425, Homework 9 (due Monday, April 7, 2008)

**Problem 1.** The joint probability density function of  $X$  and  $Y$  is given by:

$$f(x, y) = c \left( x^2 + \frac{xy}{2} \right) \quad 0 < x < 1, 0 < y < 2,$$

where  $c$  is a constant.

- (a) Find  $c$  so that this is a proper joint density.
- (b) Find the marginal density function for  $X$
- (c) Find  $P\{X > Y\}$
- (d) Find  $P\{Y > \frac{1}{2} | X < \frac{1}{2}\}$
- (e) Find  $E[X]$

**Problem 2.** A man and a woman agree to meet at a certain location about 12:30 P.M. If the man arrives at a time uniformly distributed between 12:15 and 12:45 and if the woman independently arrives at a time uniformly distributed between 12 and 1, find the probability that the first to arrive waits no longer than 5 minutes.

**Problem 3:** Jill's bowling scores are approximately normally distributed with mean 170 and standard deviation 20, while Jack's scores are approximately normally distributed with mean 160 and standard deviation 15. If Jack and Jill each bowl one game, then assuming that their scores are independent random variables, approximate the probability that:

- (a) the total of their scores is above 350.
- (b) Jack's score is higher.

**Problem 4.** According to the U.S. National Center for Health Statistics, 35.2 percent of males and 26 percent of females never eat breakfast. Suppose that random samples of 200 men and 200 women are chosen. Approximate the probability that:

- (a) at least 110 of these 400 people never eat breakfast;
- (b) the number of the women who never eat breakfast is at least as large as the number of the men who never eat breakfast.

**Problem 5.** Suppose that 2 balls are chosen without replacement from an urn consisting of 6 white balls and 9 red balls. Let  $X_i$  be equal to 1 if the  $i$ th ball selected is white, and let it equal 0 otherwise. Give the joint probability mass function (write out all the possible values) for  $X_1, X_2$ . Also, calculate the conditional probability mass function of  $X_1$  given that  $X_2 = 1$ .