TUTORIAL 06

(1) The following table uses 1992 data concerning the percentages of male and female full-time workers whose annual salaries fall into different ranges: Sup-

Earnings range	Percentage of females	Percentage of males
$\leq$9999	8.6	4.4
10,000-19,000	38.0	21.1
20,000-24,999	19.4	15.8
25,000 - 49,999	29.2	41.5
$\geq$50,000	4.8	17.2

pose that random samples of 200 male and 200 female full-time workers are chosen. Approximate the probability that
 (a) at least 70 of the women earn \$25,000 or more;
 (b) at most 60 percent of the men earn \$25,000 or more;
 (c) at least three-fourths of the men and at least half the women earn \$20,000 or more.

(2) The ideal size of a first-year class at a particular college is 150 students. The college, knowing from past experience that, on the average, only 30 percent of those accepted for admission will actually attend, uses a policy of approving the applications of 450 students. Compute the probability that more than 150 first-year students attend this college.

(3) To determine the effectiveness of a certain diet in reducing the amount of cholesterol in the bloodstream, 100 people are put on the diet. After they have been on the diet for a sufficient length of time, their cholesterol count will be taken. The nutritionist running this experiment has decided to endorse the diet if at least 65 percent of the people have a lower cholesterol count after going on the diet. What is the probability that the nutritionist endorses the new diet if, in fact, it has no effect on the cholesterol level?

(4) A roulette wheel has 38 slots, numbered 0, 00, and 1 through 36. If you bet 1 on a specified number then you either win 35 if the roulette ball lands on that number or lose 1 if it does not. If you continually make such bets, approximate the probability that
 (a) you are winning after 34 bets;
 (b) you are winning after 1000 bets;
 (c) you are winning after 100,000 bets.
Assume that each roll of the roulette ball is equally likely to land on any of the 38 numbers.

(5) Let X be an exponential random variable with parameter λ. Calculate (a) $E[X]$ and (b) $Var(X)$.

(6) At a certain bank, the amount of time that a customer spends being served by a teller is an exponential random variable with mean 5 minutes. If there is a customer in service when you enter the bank, what is the probability that he or she will still be with the teller after an additional 4 minutes?

(7) Let X be a continuous nonnegative random variable with density function f, and let X^n. Find f_Y, the probability density function of Y.