Math 474 - Homework # 7
The Poisson Distribution and the Normal approximation to Binomial Random Variables

1. Suppose you toss one 6-sided dice 100 times.

   (a) Estimate the probability that you will get between 0 and 15 fours occuring.

   (b) Estimate the probability that you get exactly 15 fours occuring.

2. Let X be a Poisson random variable with parameter $\lambda > 0$.

   (a) Show that $E[X] = \lambda$.

   (b) Show that $\mathrm{Var}[X] = \lambda$.

3. Sketch the probability distribution function for the Poisson random variable with parameter $\lambda = 1$.

4. Based on past experience, 1% of the telephone bills mailed to households are incorrect. If a sample of 20 bills is selected, find the probability that at least one bill will be incorrect. Do this using two probability distributions (the binomial and the Poisson) and briefly compare and explain your results.

5. Suppose there are 50 different lotteries and you buy one lottery ticket from each of them. Suppose also that in each lottery your chance of winning a prize is $\frac{1}{100}$. Use the Poisson distribution to approximate the probability that you will a prize in...

   (a) ...at least one of the lotteries.

   (b) ...exactly one of the lotteries.

   (c) ...at least two of the lotteries.