MATH 474 Homework 3
Due on Sept 23, 2015, Total= 30 pts

Homework submission:

1. MATH 474-01 students must submit homework in class except for reasons approved by the Instructor.

2. MATH 474-02 students must email your homework to the TA Zinovia Drakou (zdrakou@hawk.iit.edu) before the end of the due date, i.e., 11:59 pm Sept 21, 2015. Don't email them to me. Don't submit them to Blackboard.

Problem 1 (6 points: 1 pt/question) Exercise 3.1 from Textbook
Classify the following random variables as discrete or continuous:

X: the number of automobile accidents per year in Virginia.

Y: the length of time to play 18 holes of golf.

M: the amount of milk produced yearly by a particular cow.

N: the number of eggs laid each month by a hen.

P: the number of building permits issued each month in a certain city.

Q: the weight of grain produced per acre.

Problem 2 (6 points: 3, 3) Exercise 3.5 from Textbook
Determine the value c so that each of the following functions can serve as a probability distribution of the discrete random variable X

(a) $f(x) = c(x^2 + 4)$, for $x = 0, 1, 2, 3$;

(b) $f(x) = c\binom{2}{x}\binom{3}{3-x}$, for $x = 0, 1, 2$.

Problem 3 (10 points: 4, 3, 3) Exercise 3.33 from Textbook
Suppose a special type of small data processing firm is so specialized that some have difficulty making a profit in their first year of operation. The pdf that characterizes the proportion Y that make a profit is given by

$$f(y) = \begin{cases} ky^4(1-y)^3, & 0 \le y \le 1. \\ 0, & \text{elsewhere}l \end{cases}$$

(a) What is the value of k that renders the above a valid density function?

(b) Find the probability that at most 50% of the firms make a profit in the first year.

(c) Find the probability that at least 80% of the firms make a profit in the first year.

Problem 4 (8 Points: 4, 4) Exercise 3.35 from Textbook
Suppose it is known from large amounts of historical data that X, the number of cars that arrive at a specific intersection during a 20 second time period, is characterized by the following discrete probability function

$$f(x) = e^{-6}\frac{6^x}{x!}, \quad x = 0, 1, 2, \ldots.$$

(a) Find the probability that in a specific 20-second time period, more than 8 cars arrive at the intersection.

(b) Find the probability that only 2 cars arrive.