Problem Set 3

1. Suppose that a random variable X has a binomial distribution for which the parameters are $n = 15$ and $p = 0.5$. Find $\Pr(X < 6)$.

2. Suppose that the p.d.f. of a random variable X is as follows:

$$f(x) = \begin{cases} cx^2, & \text{for } 1 \le x \le 2 \\ 0, & \text{otherwise} \end{cases}$$

   1) Find the value of the constant c and sketch the p.d.f and d.f..

   2) Find the value of $\Pr(\ X > 3/2)$.

3. Suppose that a random variable X can take only the values $-2, 0, 1$ and 4, and that the probabilities of these values are as follows: $\Pr(X = -2)$=0.4, $\Pr(X = 0)$=0.1, $\Pr(X = 1)$=0.3, and $\Pr(X = 4)$=0.2, Sketch the d.f. of X.

4. Suppose that the joint p.d.f. of X and Y is as follows:

$$f(x, y) = \begin{cases} \frac{15}{4}x^2, & \text{for } 0 \le y \le 1 - x^2 \\ 0, & \text{otherwise} \end{cases}$$

   1) Determine the marginal p.d.f.' s of X and Y.

   2) Are X and Y independent?

5. Suppose that in a certain drug the concentration of a particular chemical is a random variable with a continuous distribution for which the p.d.f. g is as follows:

$$g(x) = \begin{cases} \frac{3}{8}x^2, & \text{for } 0 \le x \le 2 \\ 0, & \text{otherwise} \end{cases}$$

   suppose that the concentration X and Y of the chemical in two separate batches of the drug are independent random variables for each the p.d.f. is g. Determine 1) the joint p.d.f. of X and Y; 2)$\Pr(X = Y)$; 3)$\Pr(X > Y)$; 4) $\Pr(X + Y <= 1)$.