EE381 Homework #5

1) Find the expectation of a discrete random variable X whose probability function is given by:

$$f(x) = (\frac{1}{2})^x \quad (x = 1,2,3, \dots)$$

2) Let X and Y be independent random variables such that:

$$X = \begin{cases} 1 & \text{prob. } 1/3 \\ 0 & \text{prob. } 2/3 \end{cases} \qquad Y = \begin{cases} 2 & \text{prob. } 3/4 \\ -3 & \text{prob. } 1/4 \end{cases}$$

Find

a) E(3X+2Y)
b) $E(2X^2 - Y^2)$
c) $E(XY)$
d) $E(X^2Y)$

3) Let $X_1, X_2, \dots, X_n$ be *n* random variables which are identically distributed such that

$$X_k = \begin{cases} 1 & \text{prob. } 1/2 \\ 2 & \text{prob. } 1/3 \\ -1 & \text{prob. } 1/6 \end{cases}$$

Find

a) $E(X_1 + X_2 + \cdots + X_n)$
b) $E(X_1^2 + X_2^2 + \cdots X_n^2)$

4) A random variable X is defined by:

$$X = \begin{cases} -2 & \text{prob. } 1/3 \\ 3 & \text{prob. } 1/2. \\ 1 & \text{prob. } 1/6 \end{cases}$$

Determine the variance and standard deviation for the random variable X.

5) If a random variable X is such that $E[(X-1)^2] = 10$ and $E[(X-2)^2] = 6$
Find

a) E(X)
b) Var(X)
c) σ_X

6) Three dice, assumed fair, are tossed successively. Find

a) The mean
b) The variance of the sum

7) A random variable X has mean 3 and variance 2. Use Chebyshev's inequality to obtain an upper bound for:

a) $P(|X-3| \geq 2)$
b) $P(|X-3| \geq 1)$

Note: Your answers should show your step-by-step work. Answers which have only final results are not accepted.