EECS 861
Homework 5

1. Let Y=sample mean. Find an n such that you are 95% certain that the sample mean is within 0.5σ of μ_X.

2. Chapter 3: Problem 3.1

3. For this problem use the data in these files
   http://www.ittc.ku.edu/~frost/EECS_861/EECS_861_HW_Fall_2017/random_process_1.csv

   http://www.ittc.ku.edu/~frost/EECS_861/EECS_861_HW_Fall_2017/random_process_2.csv

   http://www.ittc.ku.edu/~frost/EECS_861/EECS_861_HW_Fall_2017/random_process_3.csv

   Each file contains data from one discrete time random process, X[n], Y[n], Z[n]. Each row is a sample function of that discrete time random process. Repeat parts a)-g) for each file.
   a) Plot the data in any 5 rows in the file.
   b) Plot the data in any 5 columns in the file.
   c) Calculate the average and standard deviation of all the values in each row, plot the row averages.
   d) Calculate the average and standard deviation of all the values in each column, plot the column averages.
   e) Consider column 1 and 2 as a pair of random samples; estimate the correlation coefficient between these samples.
   f) Repeat part e) for column 1 and 3.
   g) Repeat part e) for column 1 and 4.

4. X[n] is a discrete time random process. P(X[n] =5) = P(X[n] = -5) = 0.5 for all n.
   a. How many member (sample) functions are in the random process?
   b. Sketch each sample function of X[n].
   c. What is the pmf for X[n]?
   d. What is the joint pmf for X[n] and X[n+1]?
   e. Find E[X[n]].
   f. Find the autocovariance function of X[n].

5. Y(t) is a continuous time random process with Y(t) = rect(t-.5-D)
   [note rect(t-.5) = 1 $0<t<1$, and 0 elsewhere].
   Assume D is uniform (0,1).
   a. Sketch 5 sample functions of Y(t).
   b. What values can Y(t) take on?
   c. Find the pmf for Y(t).

6. $X(t) = A\cos(2\pi t+\varphi)$

   For $\varphi = 0$ and $P(A=-1)= P(A=1)= P(A=-3)= P(A=3)=0.25$.

   a. Sketch 2 sample functions of X(t)
   b. Find E[X(t)].

   For $A=1$ and $P(\varphi = +\pi/3)= P(\varphi = -\pi/3)=0.5$

   c. Sketch 2 sample functions of X(t)
   d. Find E[X(t)].

7. Chapter 3: Problem 3.7 a, b, c