ECE 532
Homework 3

Due Tuesday February 8 at the beginning of class

1. Consider a two-dimensional random vector $X = [X_1 \ X_2]^T$ with density function

$$p(x) = \begin{cases} 1 & \text{if } x_1^2 + x_2^2 \leq 1 \\ \\ 0 & \text{otherwise} \end{cases}$$

a. Show that X_1 and X_2 are uncorrelated.

b. Argue that X_1 and X_2 are dependent random variables.

2. Simulate the density above in Matlab using the `rand` function.

a. Generate a scatter plot of 100 independent samples from the density.

b. Generate and plot 100 independent samples of $Y = AX + b$, where $b = [1 \ -1]^T$ and

$$A = \begin{bmatrix} 1 & 0.5 \\ 0.5 & 2 \end{bmatrix}$$

c. Compute the sample mean and sample covariance of the samples of Y.

d. Use the sample mean and sample covariance to estimate A and b from the samples of Y.