FE 610. Assignment 2

due Monday September 17, 2012 at the beginning of the class (6:15pm).

This assignment is worth 10 points.

1. Problem 4 on page 118 in the Neftci textbook.

2. Let the joint density of two random variables X and Y be given by:

$$f(x,y) = Ce^{-(x+y)}, \text{ with } x > 0, y > 0$$

   (a) Calculate the value of C such that the function above is a true probability density function.

   (b) Calculate the marginal densities of X and Y.

   (c) Are the two variables independent? Justify.

   (d) Calculate $\mathbf{E}[X^2 \mid Y]$.

   (e) Calculate the 4-th moment of X and the 3-rd central moment of Y.

3. Let X_i for all i be random variables taking values 1, -1 each with probability 0.5. Let

$$S_n = \sum_{i=1}^{n} X_i$$

   S_n is called a simple random walk.

   (a) Is S_n a Markov process with respect to the filtration $\mathcal{F}_n = \sigma(S_i, i \leq n) = \sigma(X_i, i \leq n)$ generated by itself? What about X_n? Justify.

   (b) Calculate $\mathbf{E}[X_n \mid \mathcal{F}_{n-4}]$ and $\mathbf{E}[X_n \mid \mathcal{F}_n]$

   (c) Calculate $\mathbf{E}[S_n \mid S_{n-1}, S_{n-2}]$