In The Name of God, The Merciful, The Compassionate

Stochastic Processes
Department of Computer Engineering
Sharif University of Technology
Fall 2005 – CE 40-695
Homework # 1

1) A call occurs at time t where t is a random point in the interval (0, 10). (a) Find $P\{6 \le t \le 8\}.(b)$ Find $P\{6 \le t \le 8 \mid t > 5\}$.

2) Show that if the events $A_1,...,A_n$ are independent and B_i equals A_i or $\overline{A_i}$ or S, then the events $B_1,...,B_n$ are also independent.

3) The RV x is N (10; 1). Find $f(x \mid (x-10)^2 < 4)$.

4) Show that

$$F_x(x \mid A) = \frac{P(A \mid x \le x)F_x(x)}{P(A)}$$

5) The RV x is N (5, 2) and y = 2x + 4. Find $\eta_y, \sigma_y, and\ f_y(y)$.

6) Find $F_y(y)\, and\ f_y(y)\, if\ F_x(x) = (1-e^{-2x})\bigcup(x)\, and\ (a)\ y = (X-1)\bigcup(X-1); (b) y = X^{2.}$

7) The RVs x and y are independent and y is uniform in the interval (0,1). Show that, if z = z + y, then

$$f_z(z) = F_x(z) - F_x(z-1)$$

8) The RVs x and y are independent with exponential densities

$$f_x(x) = \alpha e^{-\alpha x} \bigcup(x) \quad f_y(y) = \beta e^{-\beta y} \bigcup(y)$$

Find the densities of the following RVs:

1. 2x + y 2. x – y 3. $\frac{x}{y}$ 4. Max(x,y) 5. Min(x,y)

9) Show that, if the RVs x and y are independent and z = x + y, then $f_z(z \mid x) = f_y(z-x)$

10) Prove that if two normal r.v. X and Y are uncorrelated then they are independent.