Assignment 10
MSO-201: Probability and Statistics

1. Suppose X and Y are independent N(0,1) random variables. If the PDF and CDF are denoted by $\phi(x)$ and $\Phi(x)$ respectively, find the PDF of $U = \max\{X, Y\}$.

2. Suppose X and Y are independent N(0,1) random variables. If the PDF and CDF are denoted by $\phi(x)$ and $\Phi(x)$ respectively, find the PDF of $U = \min\{X, Y\}$.

3. Suppose X and Y are independent N(0,1) random variables, find $P(2X + 3Y < 0)$

4. Suppose the random vector (X, Y) has the following joint PDF

$$f_{X,Y}(x, y) = 2e^{-(x+y)}; 0 < x < y < \infty$$

and zero, otherwise. Find the joint PDF of (U, V), where $U = 2X + 3Y$ and $V = 3X + 2Y$.

5. Suppose the random vector (X, Y) has the following joint PDF

$$f_{X,Y}(x, y) = 2e^{-(x+y)}; 0 < x < y < \infty$$

and zero, otherwise. Find the joint PDF of (U, V), where $U = X + Y$ and $V = X + 2Y$.

6. Suppose the random vector (X, Y) has the following joint PDF

$$f_{X,Y}(x, y) = xye^{-(x+y)}; 0 < x, y < \infty$$

and zero, otherwise. Find the joint PDF of (U, V), where $U = X + Y$ and $V = X - Y$.

7. Suppose X is a random variable with the following PDF for $\lambda > 0$

$$f_X(x) = \frac{\lambda}{2} e^{-\lambda|x|}; \quad -\infty < x < \infty.$$

Find the MGF of X

8. Suppose X and Y are independent identically distributed exponential random variables with mean 1. Find the joint MGF of (U, V), where $U = X + Y$ and $V = X - Y$. Find the PDF of U and the PDF of V. Are they independent.

9. Suppose X and Y are independent identically distributed non-negative random variables with PDF $f(x)$ and CDF $F(x)$. Find the PDF of $U = XY$.

10. Suppose X and Y are independent identically distributed exponential random variables with mean 1. Find the joint PDF of (U, V), where $U = XY$ and $V = X/Y$.