HOMEWORK 0

STA624.01, Applied Stochastic Processes
Spring Semester, 2016

Due: Tues Jan 26 2016

1 Suppose X is a random variable for which the mgf is as follows:

$$\psi(t) = \exp\{t^2 + 3t\}$$

for $-\infty < t < \infty$. Find the mean and variance of X.

2 Suppose X is a discrete random variable for which the mgf is as follows:

$$\psi(t) = \frac{1}{5}e^t + \frac{2}{5}e^{4t} + \frac{2}{5}e^{8t}$$

for $-\infty < t < \infty$. Find the probability function of X.

3 For all random variables X and Y, and for all constants a, b, c, d, show that

$$Cov(aX + b, cY + d) = ac \cdot Cov(X, Y).$$

4 Suppose X, Y, Z are three random variables such that $Var(X) = 1$, $Var(Y) = 4$, $Var(Z) = 8$, $Cov(X, Y) = 1$, $Cov(X, Z) = -1$, and $Cov(Y, Z) = 2$.
Determine
(a) $Var(X + Y + Z)$
(b) $Var(3X - Y - 2Z + 1)$.

5 Suppose X and Y have a continuous joint distribution for which the joint pdf is as follows:

$$f(x, y) = \begin{cases} \frac{1}{3}(x + y) & \text{for } 0 \le x \le 1, 0 \le y \le 2 \\ 0 & \text{otherwise.} \end{cases}$$

Determine the value of $Var(2X - 3Y + 8)$.

Programming problem Random walk on the finite set $\{-50, \ldots, 0, \ldots, 50\}$. You start from 0. With probability 1/2 to go ± 1 each. At -50, with probability 1, you will go to -49. At 50, with probability 1, you will go to 49. Keep continuing this process until the number of moves becomes 1000. In addition please plot the values you take. Please write this code in `R`.