بسم الله الرحمن الرحيم

King Fahd University of Petroleum and Minerals

Department of Electrical Engineering
EE 315 Probabilistic Methods in Electrical Engineering
Summer Semester (103)

Exam II
Tuesday, 2 August 2011
10:00 pm – 11:30 pm

Name: _____

ID: _____

Sections: **1**

Instructor: Wajih Abu-Al-Saud

Problem	Score	Out of
1		25
2		40
3		35
Total		100

Good luck!

Problem 1

A discrete random variable has the following probabilities

$$P\{X = -3\} = 0.1$$

$$P\{X = -1\} = 0.2$$

$$P\{X = +2\} = 0.4$$

$$P\{X = +5\} = 0.3$$

Find:

a) Mean of X

b) Variance of X

c) Skew of X

d) $E\left[4X^3 - 3X^2 + |X|\right]$

e) In a supermarket, it is found that shoppers arrive at a rate of 3 shoppers/min. Each cashier in the supermarket takes on average 1 minute to server each shopper. Find the minimum number of cashiers that the supermarket will have to operate so that at least 90% of its customers do NOT have to wait in line to be served (90% of shoppers will be served immediately because there is at least 1 open cashier).

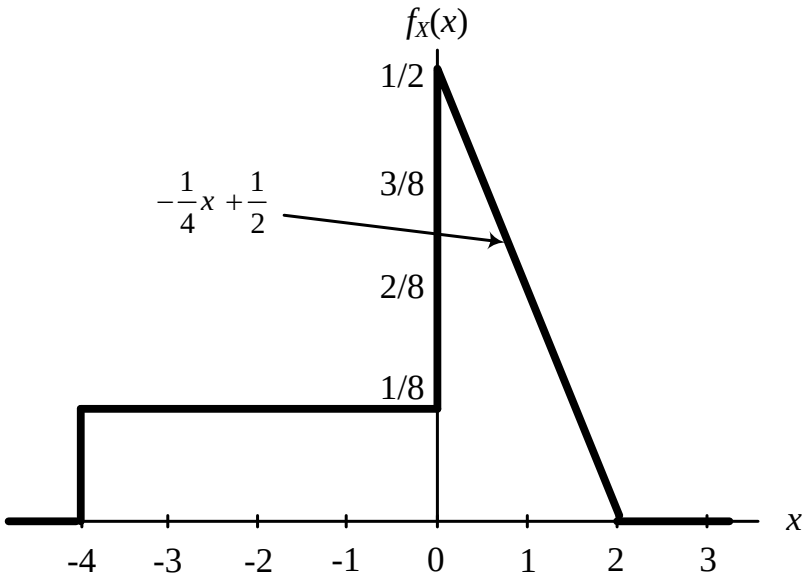
Problem 2

A random variable X has the pdf shown to the right. Another random variable Y is obtained by transforming X using the transformation

$$Y = \begin{cases} X^2 + 1 & \text{for } X < -1 \\ 2X + 4 & \text{for } X > -1 \end{cases}.$$

Find the PDF of the random variable Y for all values $-\infty < y < \infty$. Write the PDF of Y in the form of a single piecewise defined function

$$f_Y(y) = \begin{cases} \ldots & \ldots < y < \ldots \\ \ldots & \ldots < y < .. \end{cases}$$



Problem 3

The joint PDF function of two random variables X and Y is given by

$$f_{X,Y}(x,y) = \begin{cases} A\left(2x^2y + x\right) & 0 < x \le 2 \quad \text{and} \quad 0 < y \le 1, \\ 0 & \text{elsewhere} \end{cases}$$

Find:

a) Value of A that makes this function a valid PDF function.

b) $F_{X,Y}(x,y)$ for all values of $-\infty < x < \infty$ and $-\infty < y < \infty$

c) $F_X(x)$ for all values of $-\infty < x < \infty$

d) $f_Y(y)$ for all values of $-\infty < y < \infty$

e) $P\left(1 \le X < 3, \quad 0.5 \le Y < 2\right)$