

Problem Set 5

Due: 10:00 AM Friday , March 7, 2008

Note: We will refer to the text as [YG]. Starred problems are harder than the rest.

Readings: Course Notes for Lectures 10–11 and corresponding parts of [YG] Chapter 4.

Problem 1: [YG] Problem 4.1.3

Problem 2: [YG] Problem 4.2.1

Problem 3

Let the r.v. X_1 denote the earnings (in \$ per share) of GE during the next quarter. Let also X_2 denote the earnings (in \$ per share) of AOL during the next quarter. Any value of (X_1, X_2) with $0 \leq X_1 \leq 10$ and $0 \leq X_2 \leq 5$ is equally likely, that is you are given the density function

$$f_{X_1, X_2}(x_1, x_2) = \begin{cases} K & \text{if } 0 \leq x_1 \leq 10 \text{ and } 0 \leq x_2 \leq 5 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Find the value of K .
- (b) If $0 \leq X_1 \leq 2$ and $0 \leq X_2 \leq 1$ you have decided to sell whatever stocks you have of GE and AOL. What is the probability that you will do so ?
- (c) If $X_2 \leq X_1/2$ you have decided you will sell only AOL. What is the probability that you will do so ?

Problem 4

Robin Hood the archer has the particular blessing of always being able to hit the circular target at which he is shooting, regardless of the distance. Unfortunately, how close he comes to hitting the Bull's Eye is completely arbitrary. In fact, every point within the circular target has an equal probability of being hit on any given shot. This is unfortunate for Robin Hood, because if his shot is within α of the center, he wins a prize. Imagine that the target has radius R and is centered on the origin of the coordinate axes. Let X, Y denote the coordinates of the shot. The joint density of X, Y is given by the density function (uniform on the circle):

$$f_{X, Y}(x, y) = \begin{cases} \gamma & \text{if } x^2 + y^2 \leq R^2 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Find the value of γ .

(b) Find the probability that Robin Hood wins the prize.

(c) Find the marginal densities for X and Y .

Problem 5: [YG] Problem 4.4.2

Problem 6: [YG] Problem 4.8.2

Problem 7: [YG] Problem 4.9.11

Problem 8: [YG] Problem 4.10.13