Tutorial 11

Ch. 6

Dec. 2

Chapter 6 Example 1d page 225

Consider a circle of radius R, and suppose that a point within the circle is randomly chosen in such a manner that all regions within the circle of equal area are equally likely to contain the point. (In other words, the point is uniformly distributed within the circle.) If we let the center of the circle denote the origin and define X and Y to be the coordinates of the point chosen (Figure 6.1), then, since (X, Y) is equally likely to be near each point in the circle, it follows that the joint density function of X and Y is given by:

$$f(x) = \begin{cases} c & x^2 + y^2 \leq R \\ 0 & x^2 + y^2 > R \end{cases}$$

for some value of c.

a. Find c.

b. Find the marginal density functions of X and Y.

c. Compute the probability that D, the distance from the origin of the point selected, is less than or equal to a.

d. Find $E[D]$.

Chapter 6 Example 2d page 231 - Buffon's Needle Problem

A table is ruled with equidistant parallel lines a distance D apart. A needle of length L, where $L \leq D$, is randomly thrown on the table. What is the probability that the needle will intersect one of the lines (the other possibility being that the needle will be completely contained in the strip between two lines)?

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Let X, Y, Z be independent and uniformly distributed over $(0, 1)$. Compute $P(X \geq YZ)$.