Stat 134: Section 13

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Problem 1

Let (X, Y) be a point chosen uniformly at random from the unit disc, $\{(x, y) \mid x^2 + y^2 \leq 1\}$.

1. Find f_y and F_y.
2. Let $R = \sqrt{X^2 + Y^2}$. Find the density and the c.d.f. of R.

Adapted from Ex 4.5.3 in Pitman's Probability

Problem 2

Find the c.d.f. of X with density function $f_X(x) = \frac{1}{2}e^{-|x|}$ $(-\infty < x < \infty)$.
Ex 4.5.5 in Pitman's Probability

In order to integrate the density function, you will need to remove the absolute values around x. How can you do that?

Problem 3

Suppose R_1 and R_2 are two independent random variables with the same density function $f(x) = x \exp\left(-\frac{1}{2}x^2\right)$ for $x \geq 0$. Find

1. the density of $Y = \min(R_1, R_2)$;
2. the density of Y^2;
3. $\mathbb{E}Y^2$.

Ex 4.R.21 in Pitman's Probability

Problem 4

An ambulance station, 30 miles from one end of a 100-mile road, services accidents along the whole road. Suppose accidents occur with uniform distribution along the road, and the ambulance can travel at 60 miles an hour. Let T minutes be the response time (between when accident occurs and when ambulance arrives). Find

1. $P(T > 30)$;
2. $P(T > t)$ as a function of t. Sketch its graph.

Ex 4.R.5 in Pitman's Probability

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