ELEC 533: Homework 2

Due on : Please check the Course Timetable

Professor Behnaam Aazhang MWF 11:00 AM - 11:50 AM

Problem 1

Suppose X is a uniform random variable defined on $[0, 1]$. Prove that

$$\int_{-\infty}^{\infty} x dF_X = \int_{-\infty}^{\infty} x f_X(x) dx$$

Problem 2

Let X be a discrete random variable with $P(\{X = n\}) = \left(\frac{1}{2}\right)^n$, $n = 1, 2, ...$ Let $Y = g(X)$ where $g(n) = (-1)^{n+1} \left(\frac{2^n}{n}\right)$. Show that $\mathrm{E}[Y]$ does not exist.

Problem 3

a) Show that $\mathrm{E}[X] = n\theta$ and $\mathrm{Var}(X) = n\theta(1 - \theta)$ when X is a binomial random variable.

b) Find the mean and variance of a Poisson random variable.

c) Show that if X is constant then $\mathrm{E}[X]$ is equal to that constant.

Problem 4

a) Show that $X \sim \mathcal{N}(\mu, \sigma^2)$ has mean equal to μ and variance equal to σ^2.

b) Let X be a random variable with cdf from Figure 1. Compute $\mathrm{E}[X^2]$
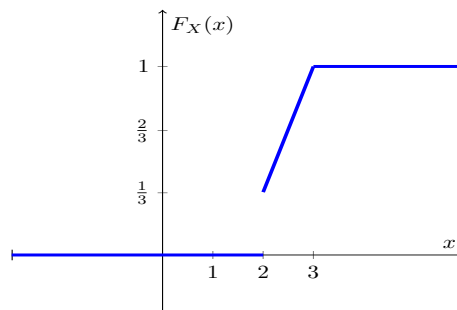

Figure 1: $F_X(x)$