EE7401 Probability and Random Processes

RA 2

1. The cdf of a random variable X is given by

$$F_X(x) = \begin{cases} \frac{1}{3} + \frac{2}{3}(x+1)^2, & -1 \le x \le 0, \\ 0, & x < -1. \end{cases}$$

Find the probability of the events $\{X > 0\}$ and $\{|X| \ge 1\}$.

2. Consider the joint probability density function $p_{X,Y}(x,y)$ for two random variables X and Y. Show that

$$p_{X,Y}(x,y) = \frac{p_{Y|X}(y \mid x)}{\int \frac{p_{Y|X}(z|x)}{p_{X|Y}(x|z)}\, \mathrm{d}z},$$

i.e., the conditional densities determine the joint density.

3. Suppose the random variable θ has pmf $\mathbb{P}(\theta = 3) = 0.4$, $\mathbb{P}(\theta = 8) = 0.6$, and $Y_1, Y_2, \ldots$ are i.i.d. random variables, independent of θ, with mean 10. What is the mean of $X = Y_1 + Y_2 + \cdots + Y_\theta$?