THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MATH4240 - Stochastic Processes - 2020/21 Term 2

Homework 1
Due date: January 22, 2021

Please hand in your answers on Blackboard to all questions below.

Q1. A plane is missing, and it is presumed that it was equally likely to have gone down in any of 3 possible regions. Let $1 - \beta_i$, $i = 1, 2, 3$, denote the probability that the plane will be found upon a search of the i-th region when the plane is, in fact, in that region. (β_i: overlook probability). What is the conditional probability that the plane is in the i-th region given that a search of region 1 is unsuccessful?

Q2. Consider a random variable X taking the values

$$k_1, k_2, \cdots, k_n \in \mathbb{R}$$

with probability

$$p_1, p_2, \cdots, p_n \in [0, 1]$$

respectively, where $p_1 + p_2 + \cdots + p_n = 1$. Write down the formula for the expected value of $f(X)$ for a given function $f(\cdot)$.

Q3. Exercises of textbook (Chapter 1, starting from page 41): 4.

Q4. Compute the distribution of $X + Y$ in the following cases:

(a) X and Y are independent binomial random variables with parameters (n, p) and (m, p).

(b) X and Y are independent Poisson random variables with means respective λ_1 and λ_2.

(c) X and Y are independent normal random variables with respective parameters (μ_1, σ_1^2) and (μ_2, σ_2^2).

Q5. Read materials on *Law of Large Number* and *Central Limit Theorem* in the book "*A First Course in Probability*" by Ross (Chapter 8), and write down the statements of both theorems.