Mathematical Finance Assignment-1

Due: 23rd April, 11:59 PM

Instructions:

- You are allowed to discuss solutions, but assignments must be written and submitted by yourself.
- You can either submit handwritten or typeset assignments as per your convenience.
- These assignments won't be graded but our mandatory for getting ratified.

Questions:

1. Suppose you are tossing a coin until you hit heads. Further, suppose the probability that head turns up is p and X is a random variable counts the number of failures. (If you get heads after 10 throws, then number of failures is 9).

   Find the probability distribution of X and prove that for any integers $m, n \geq 0$

   $$\mathbb{P}\left[X > m + n \mid X > n\right] = \mathbb{P}\left[X > m\right].$$

2. Let X be a Poisson random variable with parameter λ. Calculate the mean and variance of X.

3.* Let X be a normal random variable with mean μ and variance σ^2, show that $X = \sigma Z + \mu$ where Z is the standard normal random variable (mean 0 and variance 1).