IE241 Engineering Statistics 1 Homework 2

Due date : April 3

1. Solve the following questions in the textbook.
3.29
3.36
3.56
3.72
3.97
3.105
3.132
3.133
3.155
3.177
3.202

2. A pair of coins are tossed simultaneously. Each coin has probability p to be a head.

(a) What is the probability that the outcomes of the two coins are different?

(b) Suppose this pair of coins are tossed n times.
Let *X* = The total number of tosses where the outcomes of the two coins are different.
What is the distribution of *X*?

(c) Continue part (b). Suppose that you gain $1 for each toss where the outcomes of the two coins are different, and lose $1 for each toss where the outcomes of the two coins are the same.
Let *Y* = The total amount of gain. Express *Y* in terms of *X*. Then compute the expected value and variance of *Y*.

3. A random variable Y follows a hypergeometric probability distribution with

$$p(y) = \frac{\binom{r}{y}\binom{N-r}{n-y}}{\binom{N}{n}}$$

where y is an integer $0, 1, \ldots, n$, subject to the restrictions $y \leq r$ and $n - y \leq N - r$.
Show that

$$\mu = E(Y) = \frac{nr}{N} \quad and \quad \sigma^2 = V(Y) = n\left(\frac{r}{N}\right)\left(\frac{N-r}{N}\right)\left(\frac{N-n}{N-1}\right).$$