## Homework Week 2

**Problem 1: 예제 2.6**
두 확률변수 $X, Y$의 결합 확률분포함수가

$$F_{X,Y}(x, y) = xy \quad (0 < x < 1, 0 < y < 1)$$

라고 주어졌을 때, $P(X^2 < Y)$를 구하여 보자.

**Problem 2 : 예제 2.7**
두 확률변수 $X, Y$의 결합 확률밀도함수가

$$f_{X,Y}(x, y) = xye^{-(x+y)}I(x > 0, y > 0)$$

라고 주어졌다고 할 때, 이 때 $Y$의 주변 확률밀도함수?

**Problem 3**
확률밀도함수 $f(x)$를 따르는 모집단으로부터의 랜덤샘플 $X_1, \ldots, X_n$에 대하여
표본평균 $\overline{X} = \dfrac{X_1 + X_2 + \cdots + X_n}{n}$의 기댓값을 확률밀도함수$f(x)$를 이용하여
표현하시오.

**Problem 4**

A balanced coin is tossed three times. Define a random variable $X=$ the number of heads and a random variable $Y=$ the number of tails. Find the followings.

- The joint probability density function of $(X, Y)$

- The marginal probability density functions of $X$ and $Y$.

- The conditional probability density function $f_{Y|x}(y|x)$

**Problem 5**
We consider a random vector $(X, Y)$ with the joint probability density function

given by

$$f_{X,Y}(x,y) = 2e^{-x}e^{-2y}I(0 < x < \infty)I(0 < y < \infty)$$

Find the followings

- $P(X > 1, Y < 1)$

- $P(X < Y)$

- $P(X > 1 | Y = 1)$

- $E(X)$

- $E(Y)$

- $E(XY)$