Exercise 1

Show that the Maximum a posteriori (MAP) estimate becomes Maximum likelihood (ML) estimate if we assume uniform prior distribution for the parameters θ.

Exercise 2

Suppose that there is a box with three coins and the probability of head for each coin is $P(H|c_1) = \frac{1}{3}$, $P(H|c_2) = \frac{1}{2}$ and $P(H|c_3) = \frac{2}{3}$. One coin was picked at random and tossed 100 times. The result is 49 heads and 51 tails. Predict the coin.

Exercise 3

The Poisson distribution is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time. The probability mass function is given by :
$P(X = k|\mu) = \frac{\mu^k e^{-\mu}}{k!}$ where $\mu > 0$.

Now consider a factory in which a group of industrial robots are used for manufacturing the automobile parts. Sometimes the parts are found to be defective. The number of defective parts produced in n different months are given by $X = x_1, x_2, \dots, x_n$, which are assumed to be i.i.d. poisson random variables.

a) Use the samples to get a maximum likelihood estimate of μ.
b) For $\mu = 10$, find the probability of producing more than 4 defective parts in a month.