

Homework 1

Name: Lim Yu Guang

Matriculation Number: A0172618B

1.

$$P(x; \lambda) = \frac{\lambda^x e^{-\lambda}}{x!}, \quad x = 0, 1, 2, \dots, n$$

$$\begin{aligned} L(\lambda) &= \prod_{i=1}^n f(x_i | \lambda) \\ &= \prod_{i=1}^n \frac{\lambda^{x_i} e^{-\lambda}}{x_i!} \end{aligned}$$

$$\ln L(\lambda) = \sum_{i=1}^n x_i \ln \lambda - n\lambda - \sum_{i=1}^n \ln(x_i!)$$

$$\frac{d \ln L(\lambda)}{d\lambda} = 0$$

$$\frac{\sum_{i=1}^n x_i}{\lambda} - n = 0$$

$$\frac{\sum_{i=1}^n x_i}{\lambda} = n$$

$$\lambda = \frac{\sum_{i=1}^n x_i}{n}$$

$$\lambda = \frac{1}{n} \sum_{i=1}^n x_i$$

2.

No. of samples	MLE estimate
1	3
2	2
3	2
4	1.75
5	1.8
6	1.666666667
7	1.428571429
8	1.5
9	1.444444444
10	1.3
11	1.636363636
12	2
13	2.076923077
14	2.071428571
15	2.2
16	2.3125
17	2.176470588
18	2.333333333
19	2.473684211
20	2.5

