

Question 14

(a) Likelihood function of Poisson distribution:

$$L(u) = \prod_{i=1}^N \frac{u^{x_i} e^{-u}}{x_i!}$$

Log likelihood function of Poisson distribution:

$$l(u) = \sum_{i=1}^N (x_i \log u - u - \log x_i!) = \log u \sum_{i=1}^N x_i - Nu - \sum_{i=1}^N \log x_i!$$

(b) Take the derivative of the log likelihood function w.r.t u :

$$l'(u) = \frac{\sum_{i=1}^N x_i}{u} - N = 0$$

(c) Set the derivative to 0 and solve for the MLE of u :

$$u = \frac{\sum_{i=1}^N x_i}{N} = \bar{X}$$