**INFERENCE**: Homework 

*Professor Regina*

Fan Yang

UNI: fy2232

# Problem 1 (#1 on page 375)





*X* follows , so  and



Using Central Limits Theorem,



So, let



then, , which is k=8

# Problem 2 (#3 on page 375)

Since *X* has the Poisson distribution with mean 10, the variance is also 10 too.





Using Poisson table:



# Problem 3 (#1 on page 461)

## (a)





This is a Beta distribution with  and 

## (b)

In order to get squared error loss, the estimator should be mean of the posterior distribution.



# Problem 4 (#3 on page 461)



This is a Beta distribution with  and 

In order to get squared error loss, the estimator should be mean of the posterior distribution.



# Problem 5 (#4 on page 461)

Likelihood function is



Because , the support for  is 

What’ s more, likelihood function is a monotone decreasing function, when  equals to its minimum value, likelihood function reach its maximum value. Therefore,



# Problem 6 (#7 on page 462)

## (a)

Likelihood function is:



Log-likelihood function is:



Let , we have 

so, 

## (b)





so, 

then,



This is a Gamma distribution with  and 

# Problem 7(#9 on page 462)

## (a)





So, 



## (b)

Let 

which is 

so, 

# Problem 8 (#10 on page 462)



As we know in class that the MLE for  is , and likelihood function increases before  and decreases after .

so, the MLE for  should be 

While the support of  is 

if , 

if , 

if , 

# Problem 9 (#14 on page 462)

The likelihood function is



Let  and 

Then we know  is a pair of jointly sufficient statistics.

# Problem 10 (#15 on page 462)

The likelihood function is



The likelihood function increases when  increases. While the support of  is , so when  likelihood function reaches maximum value. Therefore,



# Problem 11 (#16 on page 462)

While the MLE of  is already the minimal possible value for , we only need to show it is a sufficient statistic:



Let  and 

Then we know  is a sufficient statistic and now it is minimal sufficient statistic.

# Problem 12 (#17 on page 462)

Likelihood function is:



Log-likelihood function is:





When , the likelihood gets maximum value.

Therefore, the MLEs are



# Problem 13 (#18 on page 462)



From the likelihood function we see  is a pair of jointly sufficient statistics. While  and  is an one-to-one transformation from , so  and  is a pair of sufficient statistics. Then they are minimal sufficient statistics.