

MS-501 Assignment

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###Required Codes and Graphs for Question 1

##Specifying the distribution of Y(i)

```
y=c(9.01,3.06,4.21,1.76,8.00,14.98,1.80,35.26,2.17,9.13,2.92,1.68,1.26,13.58,
8.31,34.64,0.07,2.56,2.22,2.00,2.56,32.47,3.85,6.59,0.68,3.14,6.17,3.43,12.19
,4.25,4.46,8.93,42.19,4.72,0.65,14.54,0.31,11.57,2.62,3.61,13.69,0.96,5.76,6.
10,5.35,1.89,2.09,1.76,3.99,0.18,18.02,19.20,8.98,16.53,33.71,46.50,17.49,22.
78,0.77,13.26,15.74,3.67,26.21,1.44,28.59,15.11,2.28,2.24,5.89,7.45,4.64,18.2
0,3.90,24.74,0.59,2.89,3.25,0.51,10.50,24.85,43.73,9.27,3.65,0.00,13.86,8.24,
2.73,4.19,0.66,19.50,3.27,25.02,14.08)
mean(y)

## [1] 9.865054

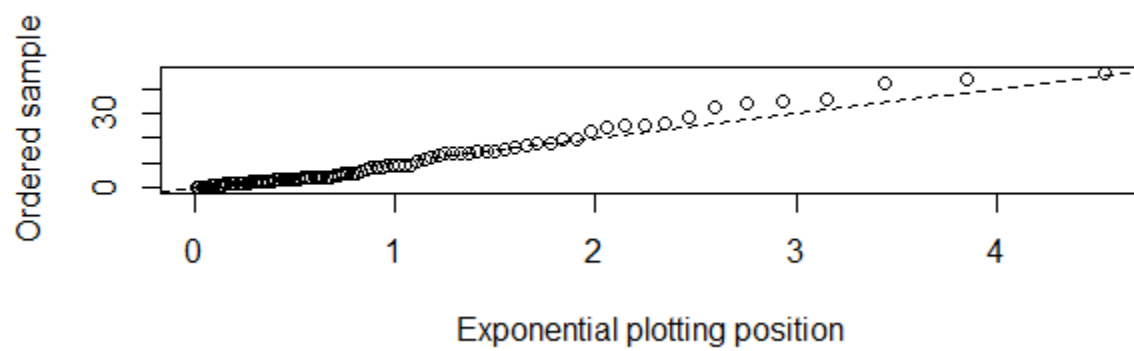
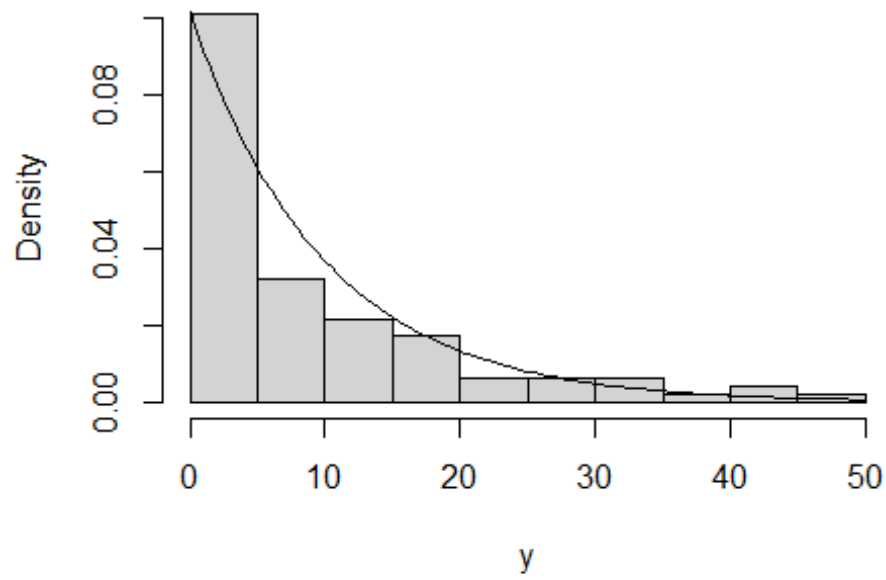
hist(y,breaks=10,freq=FALSE,main = "Histogram of Y")
curve(dexp(x,(1/9.865)),0,50,add=TRUE)

install.packages('SMPracticals')

library(SMPracticals)

qqexp(y,line=TRUE)
```

Histogram of Y



```
sd(y)
```

```
## [1] 10.82285
```

```
##Obtaining MLE(ii)
```

```
n=100
```

```
m=7
```

```
mu=sum(y)
```

```
s=5
```

```
lamda_mle=(n-m)/(mu+(s*m))
```

```
lamda_mle
```

```
## [1] 0.09764292
```

```
##EM algorithm for estimating the parameter(iii)
```

```
em_mle<-function(t0)
```

```
{
```

```
  theta_initial<-t0
```

```
  ## update the theta_initial after replacing missing value ##
```

```
  theta_update<-100/(917.45+35+(7/theta_initial))
```

```
  ## Calculate the difference ##
```

```
  diff<-abs(theta_update-theta_initial)
```

```
  ## set the counter and epsilon ##
```

```
  s<-1
```

```
  epsilon<-.0001
```

```
  while(diff>.0001)
```

```
  {
```

```
    theta_initial<-theta_update
```

```
    theta_update<-100/(917.45+35+(7/theta_initial))
```

```
    diff<-abs(theta_update-theta_initial)
```

```
    s<-s+1
```

```
  }
```

```
  return(data.frame(Iterations=s, Estimate=theta_update))
```

```
}
```

```
## running the code for different initial settings ##
```

```
em_mle(.5)

##    Iterations    Estimate
## 1             4 0.09764481

em_mle(.6)

##    Iterations    Estimate
## 1             4 0.09764488

em_mle(.8)

##    Iterations    Estimate
## 1             4 0.09764498

em_mle(1)

##    Iterations    Estimate
## 1             4 0.09764504

em_mle(1.2)

##    Iterations    Estimate
## 1             4 0.09764507

em_mle(1.5)

##    Iterations    Estimate
## 1             4 0.09764511

em_mle(2)

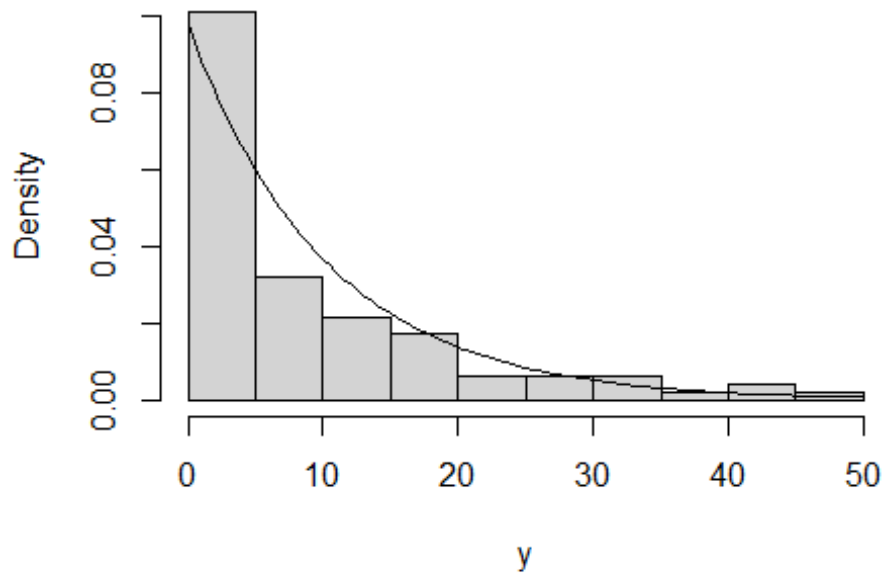
##    Iterations    Estimate
## 1             4 0.09764515

em_mle(20)

##    Iterations    Estimate
## 1             4 0.09764525

#Curve fitting with MLE
hist(y,breaks=10,freq=FALSE,main = "Histogram of Y")
curve(dexp(x,0.09764292),0,50,add=TRUE)
```

Histogram of Y



```
#Curve fitting with EM estimate  
hist(y,breaks=10,freq=FALSE,main = "Histogram of Y")  
curve(dexp(x,0.09764498),0,50,add=TRUE,col='red')
```

Histogram of Y

