Project, Question 1

1. Show where the distribution is centered at and compare it to the theoretical center of the distribution.

```
library(ggplot2)
nosim=1000
nsam=40
lambda=0.2
dataSam<-rexp(nosim*nsam,lambda)
data.mean<-apply(matrix(dataSam,nosim,nsam),1,mean)
```

Mean of distribution center:

```
dist.center<-mean(data.mean)
dist.center
```

```
## [1] 5.026294
```

Mean of Theoretical Center (exponential distribution):

```
exp.center<-1/lambda
exp.center
```

```
## [1] 5
```

The above results show that the distribution mean is equal to theoritical mean

2. Show how variable it is and compare it to the theoretical variance of the distribution.

Variance of simulated data distribution:

```
dist.variance<-(sd(data.mean))^2
dist.variance
```

```
## [1] 0.6285328
```

Theoretical variance (exponential distribution):

```
exp.variance<-((1/lambda)^2)/nsam
exp.variance
```

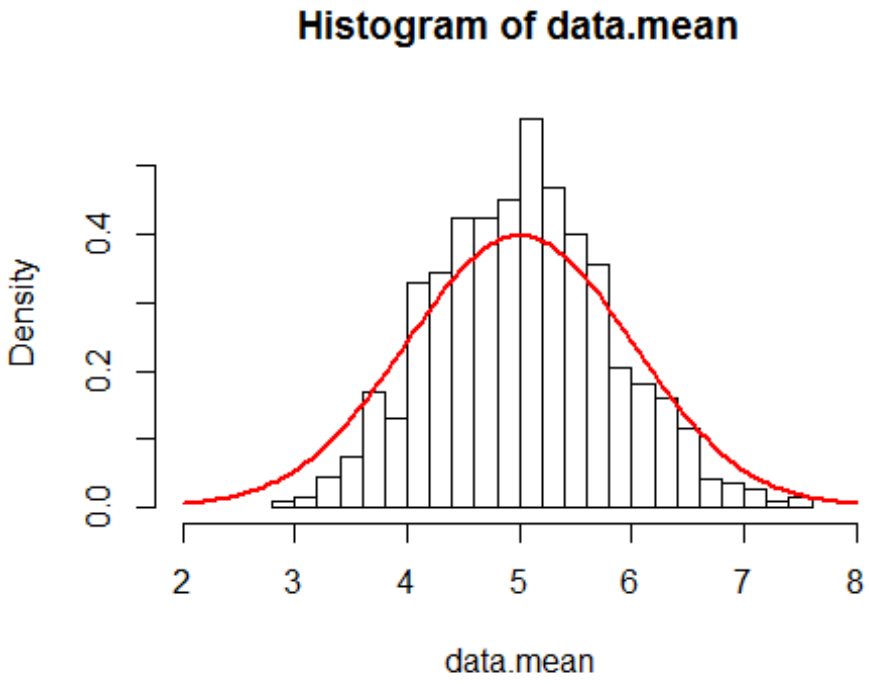
```
## [1] 0.625
```

the above results shows that the variance of simulated of data is almoset same astheoretical variance of distribution.

3. Show that the distribution is approximately normal.

```
hist(data.mean, freq = FALSE, breaks = 20, xlim = c(2, 8))
nx <- seq(2, 8, length=100)
```

```
hx <- dnorm(nx,mean=5,sd=1)
lines(nx,hx, lwd=2, col="red")
```



4. Evaluate the coverage of the confidence interval for 1/lambda: $\bar{X} \pm 1.96Sn$???.

```
interval <- dist.center +c(-1,1)*1.96*sqrt(dist.variance/nsam)
interval

## [1] 4.780602 5.271985
```

As the results showes, theoretical mean value (i.e. 5) is in the interval range. Therefore, our simulation of distribution have been done well.