PSTAT174 Lab 01

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Q1

```
set.seed(100)
x = runif(1000,-1,1)
y = x^2
cor(x,y)
```

```
## [1] 0.06219732
```

```
cov(x,y)
```

```
## [1] 0.01079364
```

X and y are uncorrelated since cor(x,y) = 0.06219732 which is very close to zero.

X and Y are not dependent since cov(x,y) is not equal to 0.

It could happen that two variables are uncorrelated but not dependent.

Q2

```
set.seed(1011)
x1 = runif(10,-1,1)
x2 = runif(100,-1,1)
x3 = runif(1000,-1,1)
mean(x1)
```

```
## [1] 0.06742002
```

```
mean(x2)
```

```
## [1] 0.03776725
```

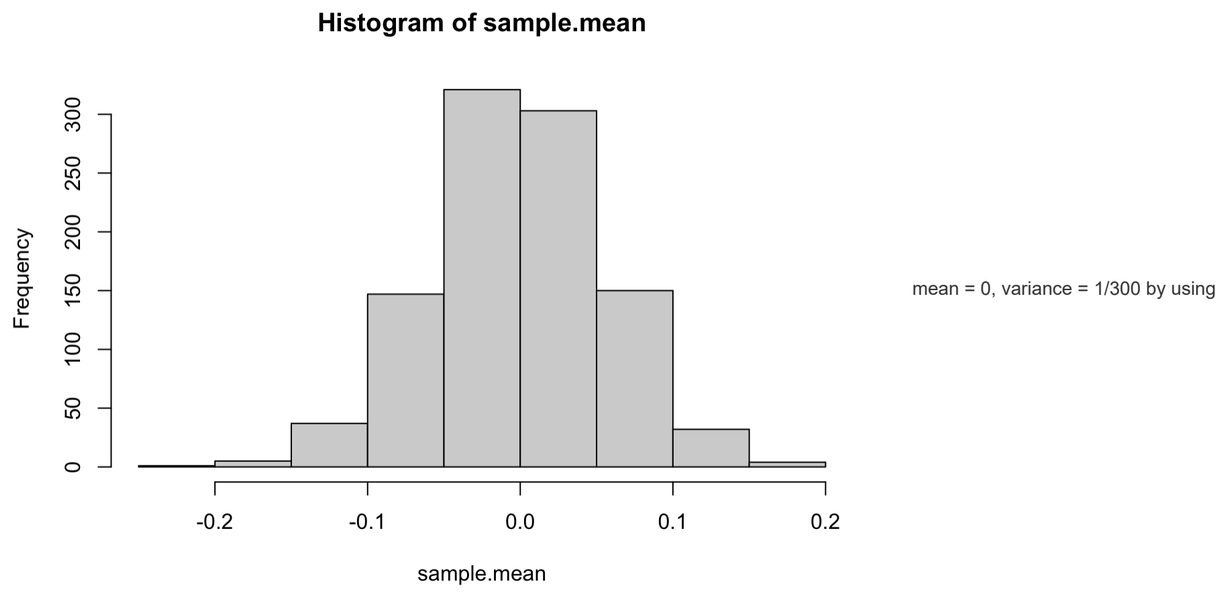
```
mean(x3)
```

```
## [1] 0.01280656
```

As sample size increases, sample mean is approaching to the true mean.

Q3

```
n =100
rows = 1000
sim = matrix(runif(n*rows,-1,1),rows)
sample.mean = rowMeans(sim)
hist(sample.mean)
```



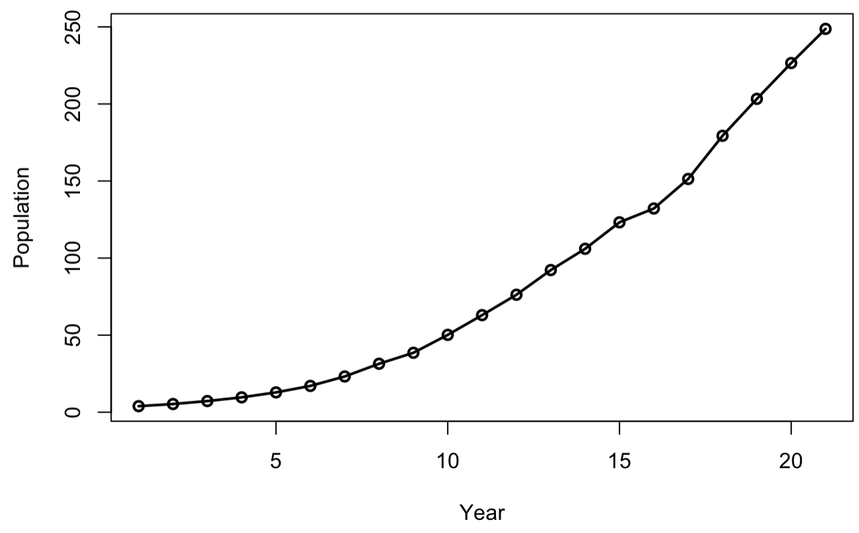
mean = 0, variance = 1/300 by using central limit theorem, it's normal distribution

Q4

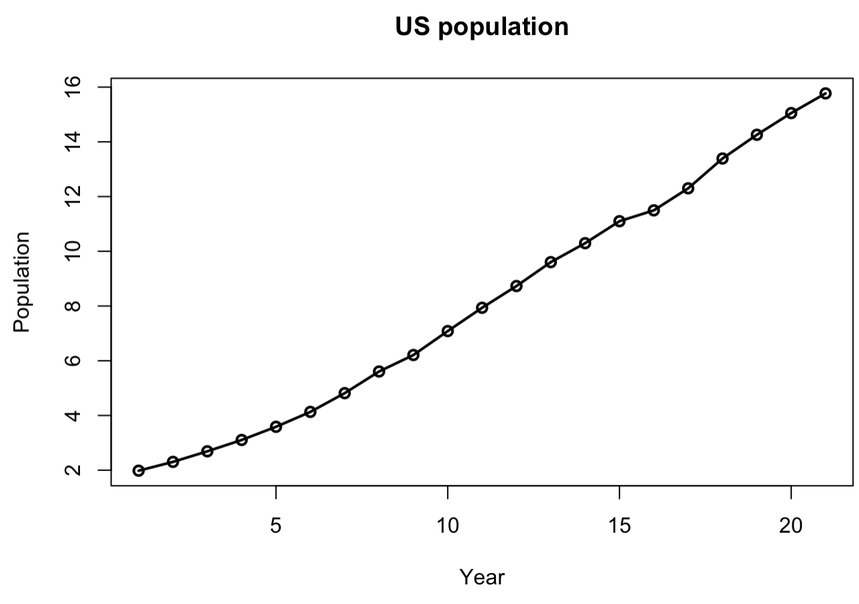
```
uspop = scan("uspop.txt")
uspop
```

```
##  [1]   3929214   5308483   7239881   9638453  12860702  17063353  23191876
##  [8]  31443321  38558371  50189209  62979766  76212168  92228496 106021537
## [15] 123202624 132164569 151325798 179323175 203302031 226542203 248709873
```

```
plot(uspop/1000000, type = "o", main = "US population", xlab = "Year", ylab = "Population", lwd = 2)
```




```
plot(sqrt(uspop/1000000), type = "o", main = "US population", xlab = "Year", ylab = "Population", lwd = 2)
```



For the sqrt, the graph is more linear。