In-Class Assignment 16

1. The fuel efficiency of a set of 25 cars is calculated to have a mean value of 22.3 mpg with a standard deviation of 5. We want to determine whether this value is statistically different from 20.09 mpg, the mpg value in the mtcars dataset, at the 95% confidence level.

(a) State the null hypothesis. Is it one-sided or two-sided?

(a) The null hypothesis is that the fuel efficiency is =20.09 mpg. This is two-sided

(b) Determine whether the null hypothesis is or is not falsified, by a Monte Carlo simulation with 100,000 runs. What is the p-value? Compare your result to what you got last Wednesday.

```
trials <- 100000
sampmean <- 22.3
H0mean <- 20.09
sampsd <- 5
n <- 25
p_value <- 0
sampse <- sampsd/sqrt(n)
simmean <- rep(0,trials)
for(i in 1:trials){  simsamp <- H0mean + sampsd*rt(n, n - 1)   simmean[i] <- mean(simsamp)}
p_value <- sum(abs(simmean - H0mean) > abs(sampmean - H0mean))/trials
p_value = 0.0342
```

Makes sense cause last week we got 0.03688981 very similar!

2. A set of sample data follows an exponential distribution. The set has 750 samples with a mean value of 30. Perform a hypothesis test with simulation (10,000 runs) to determine whether the mean value is 95% likely to be greater than 28.

```
trials <- 10000
sampmean <- 30
n <- 750
H0mean <- 28
simmean <- rep(0,trials)
```

```
for(i in 1:trials){
  simsamp <- rexp(n, 1/H0mean)
        simmean[i] <- mean(simsamp)}
p_value <- sum(simmean >= sampmean)/trials
p_value = 0.0267
```

So confirms that our null hypothesis is wrong!