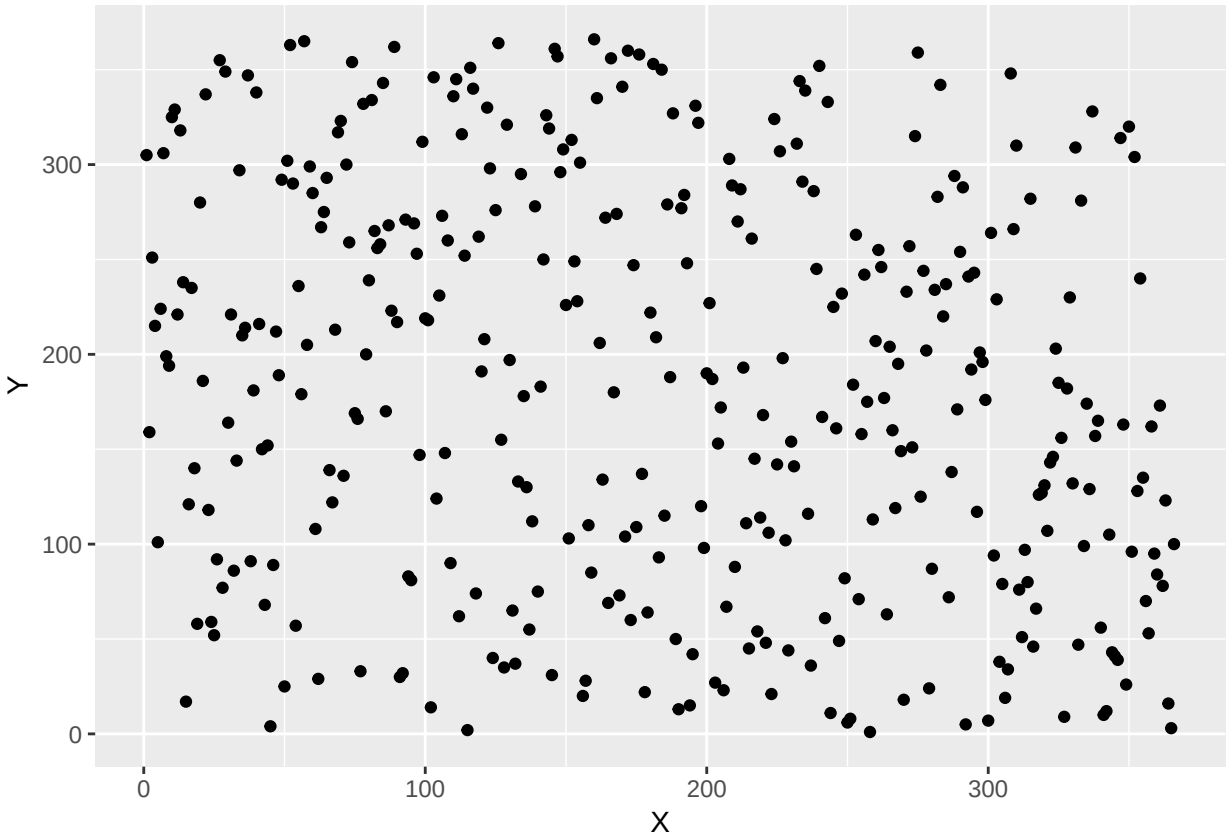
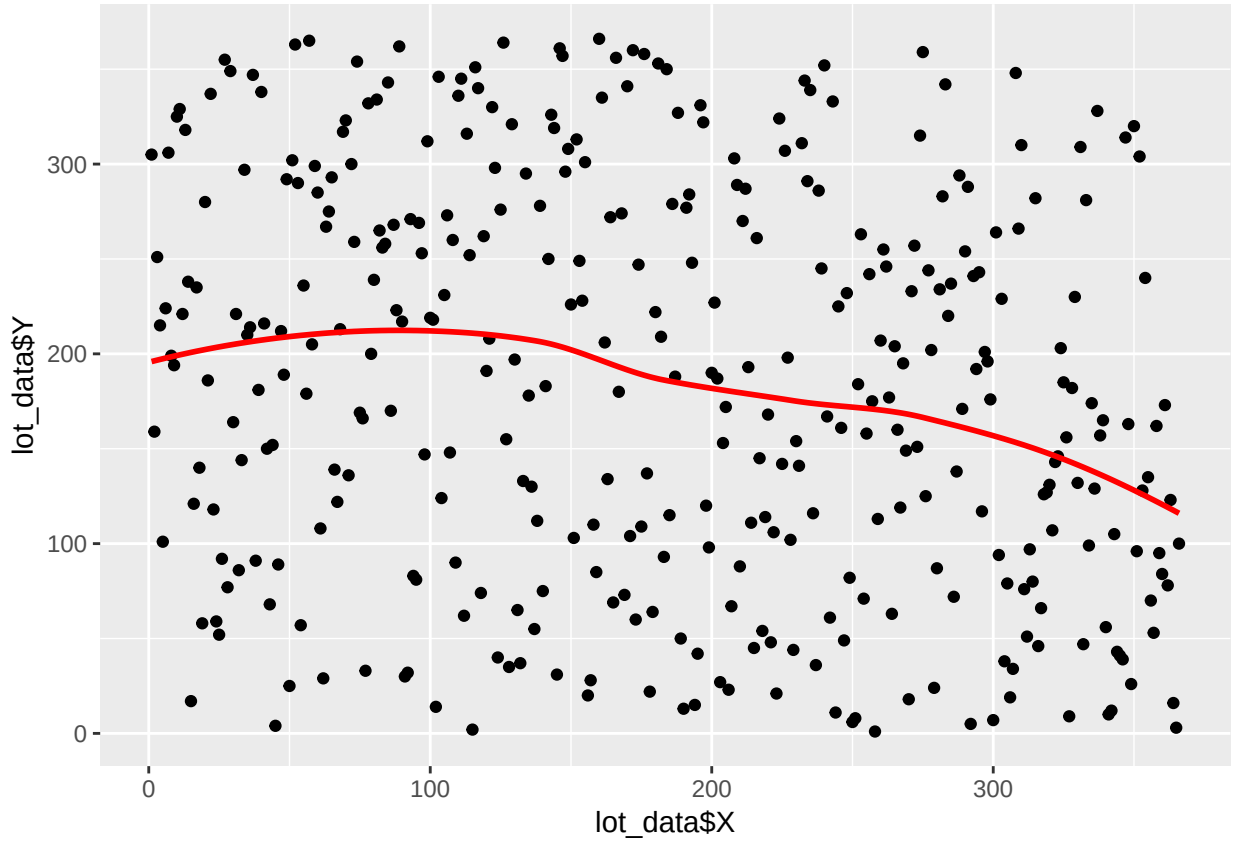
Assignment 1

Q1



The data looks randomly distributed from this plot.

Q2



The smoothed line is not able to fit the data, this again indicates that the data is randomly distributed.

Q3

```
The value of T-Test for the original dataset is : -0.2671794
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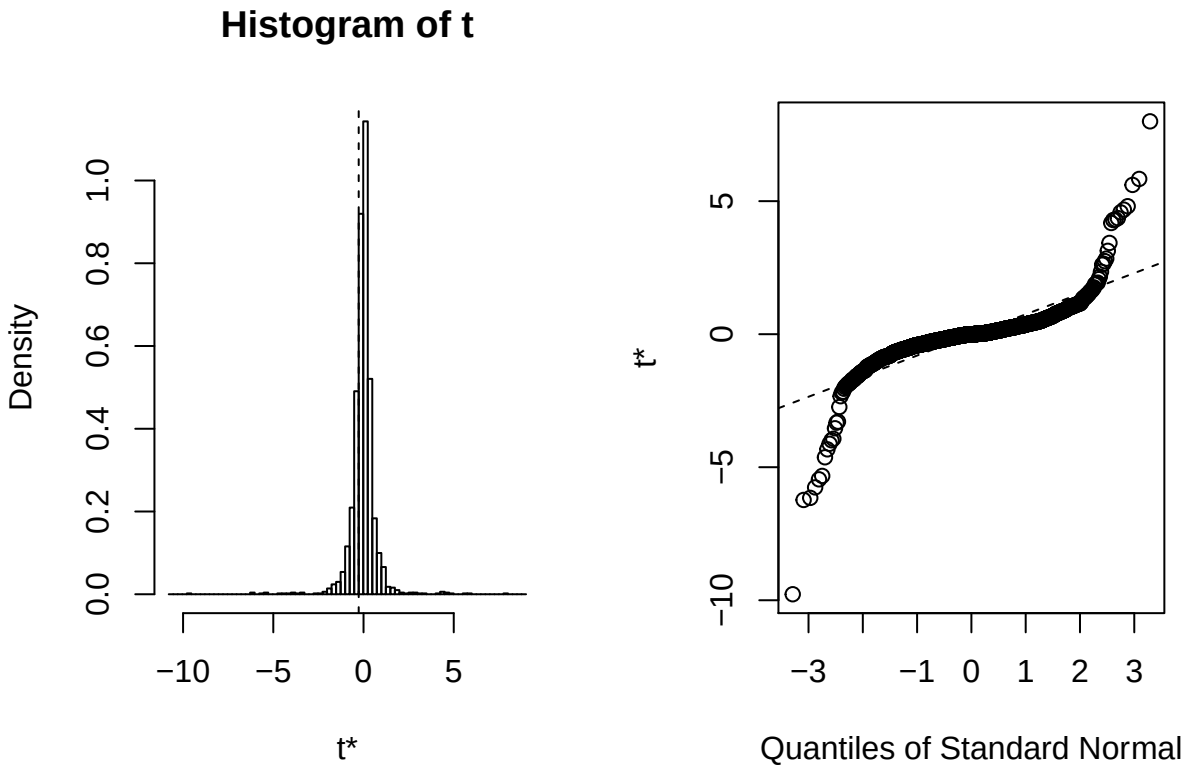
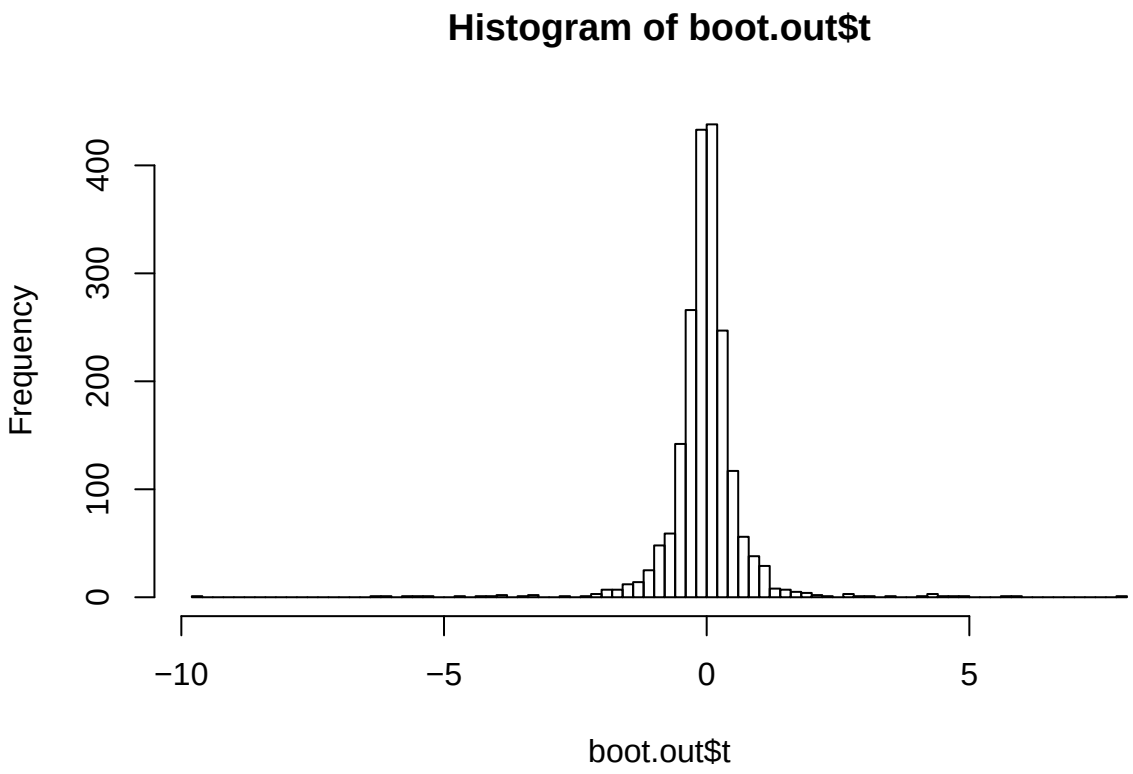

Histogram of t
Density
0.0
0.2
0.4
0.6
0.8
1.0
−10
−5
0
5
t*
t*
5
0
−5
−10
−3
−1
0
1
2
3
Quantiles of Standard Normal




```
T is normally distributed with mean value,  -0.02835058  and standard deviation,  0.7746504
```

T looks normally distributed to me, with mean centered close to zero. The QQ plot also indicates that T is normally distributed as most of the values are close to the line.

This again indicates that the data was randomly distributed, as the mean value of T sampled 2000 times is also not significantly greater than 0.

```
BOOTSTRAP CONFIDENCE INTERVAL CALCULATIONS
Based on 2000 bootstrap replicates

CALL :
boot.ci(boot.out = boot.out, type = "norm")

Intervals :
Level      Normal
95%   (-2.0243,  1.0123 )
Calculations and Intervals on Original Scale
```

Since the 95% confidence interval is not significantly greater than 0, we can still say that the data is randomly distributed.

```
P-value :  0.5145972
```

In this case: H_0 -> T statistic is not significantly greater than 0. (null Hypothesis) H_a -> T statistic is significantly greater than 0. (alternative Hypothesis)

I am calculating the P-value with respect to 0, as this is the point that determines if our null Hypothesis (data is randomly distributed) is accepted or rejected. If the T value is significantly greater than 0 then the

data is not random and null Hypothesis is rejected. So the probability that the T value of a random sample from the data will be smaller than zero is calculated here.

Q4

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P-value using Permutation Test :  0.453
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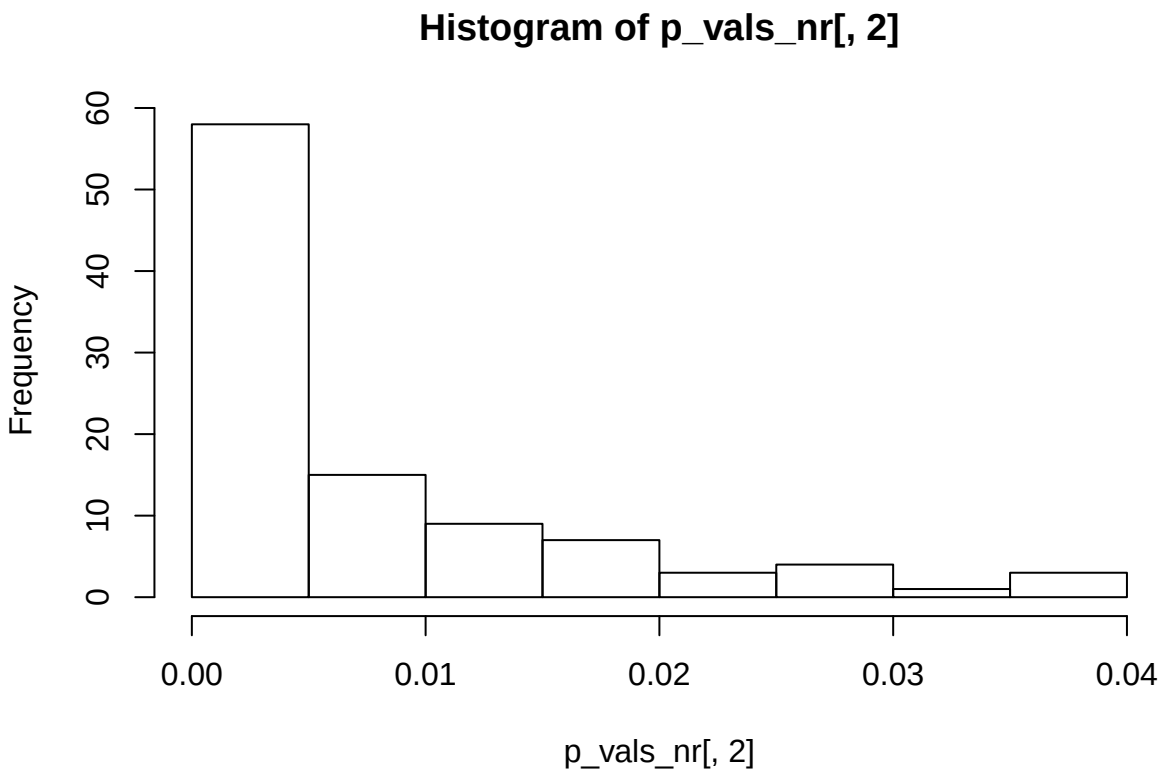
Since P value calculated above is not significant (> than 0.05) hence we failed to reject the null hypothesis which implies that lottery is random.

Q5



As we can see from the histogram, the maximum p-value we got from this non-random data is significant, so we can reject the null hypothesis for all the alpha values. This is what was expected and this proovs that the test is a good test to check if a random variable is from a random distribution or not.