Assignment 3
Computer simulation course

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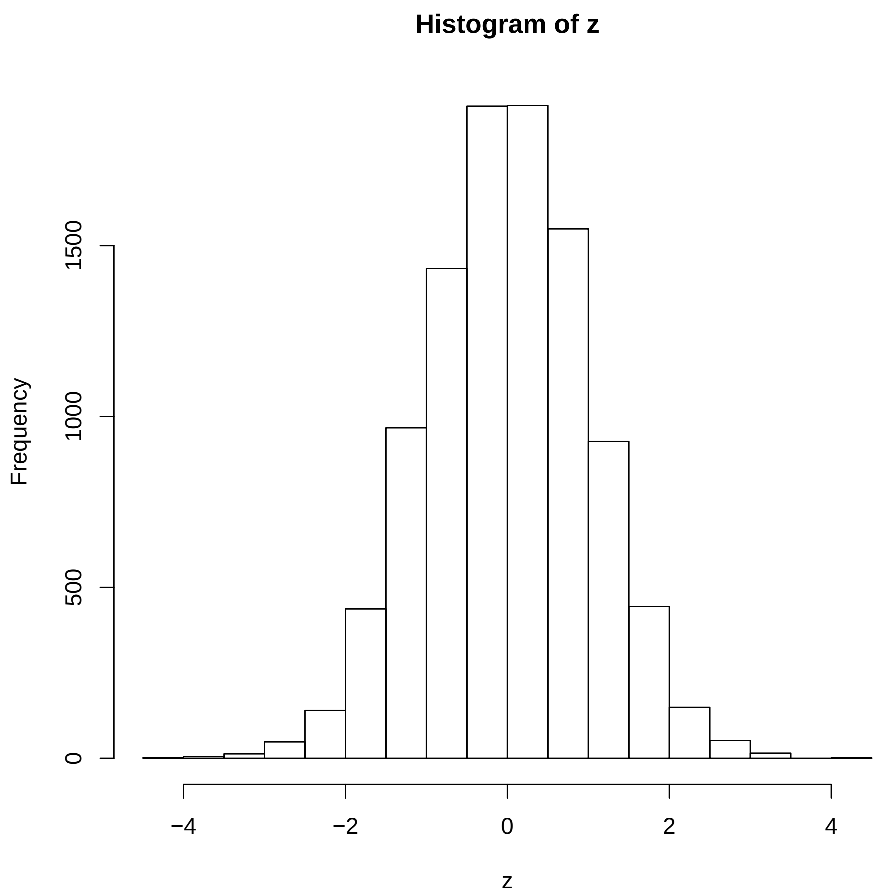
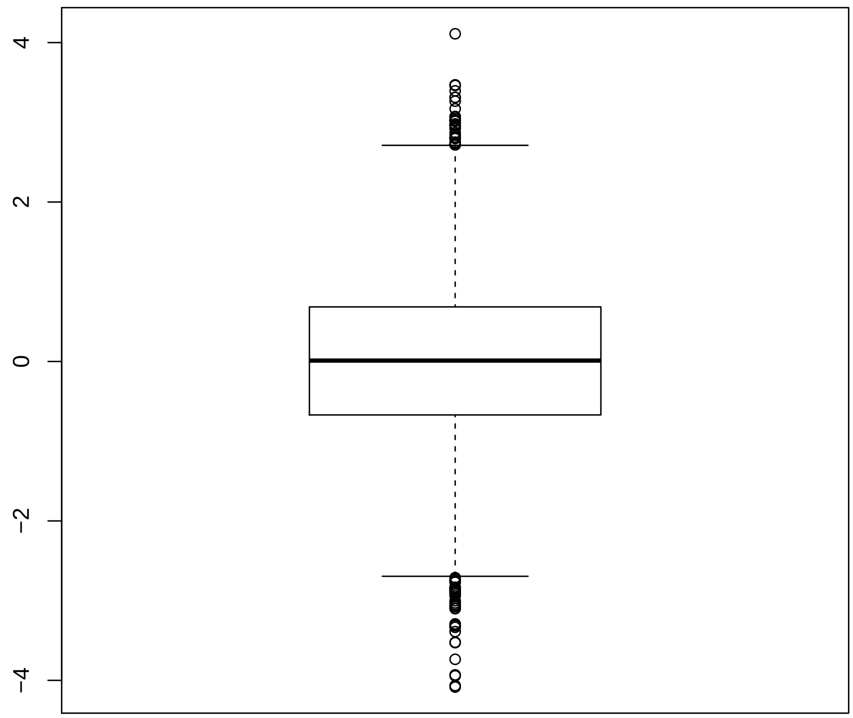
October 17, 2021

Part 1:

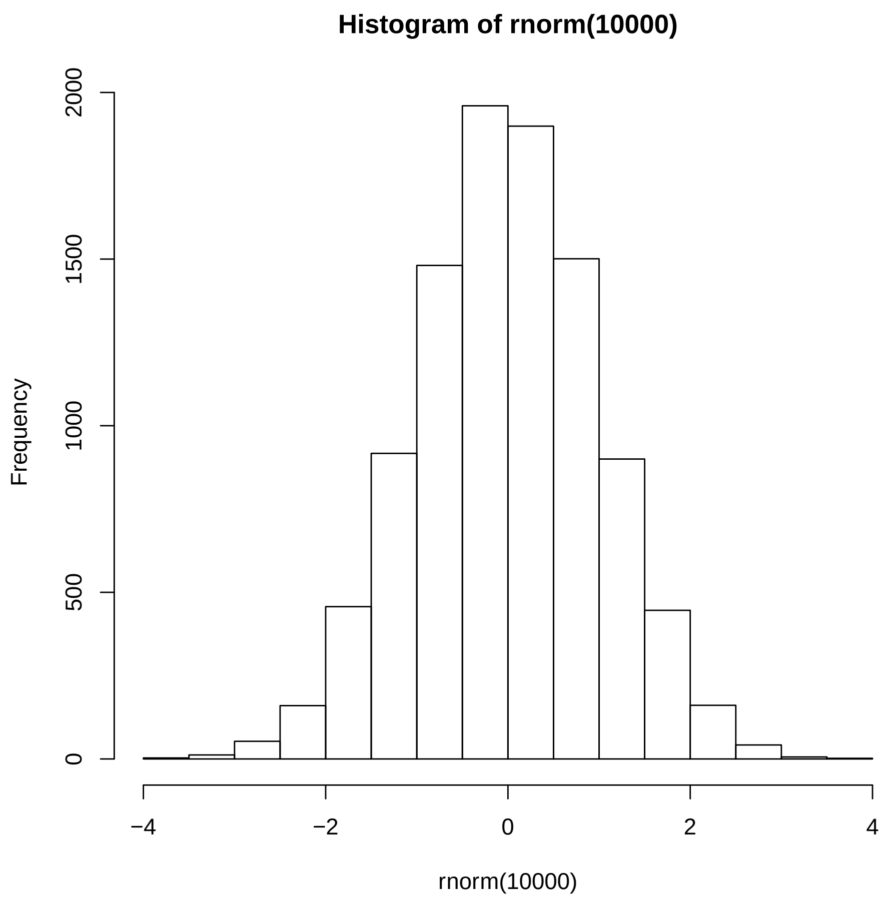
```
f <- function(x) dnorm(x)
g <- function(x) dcauchy(x)

arnc <- function(n=100, M=1.52){
    x <- rep(0,n)
    for (i in 1:n){
        repeat{
            y <- rcauchy(1)
            u <- runif(1,0,1)
            if(u < (f(y)/(M*g(y)))) break
        }
        x[i] <- y
    }

    return(x)
}

arnc(10)

##  [1] -0.7141945  0.7920317  0.6804366  0.1443330 -0.3307391  0.9107635
##  [7]  1.5056402 -0.2882457  0.1611060 -0.8115746

z= arnc(10000)
hist(z)
```



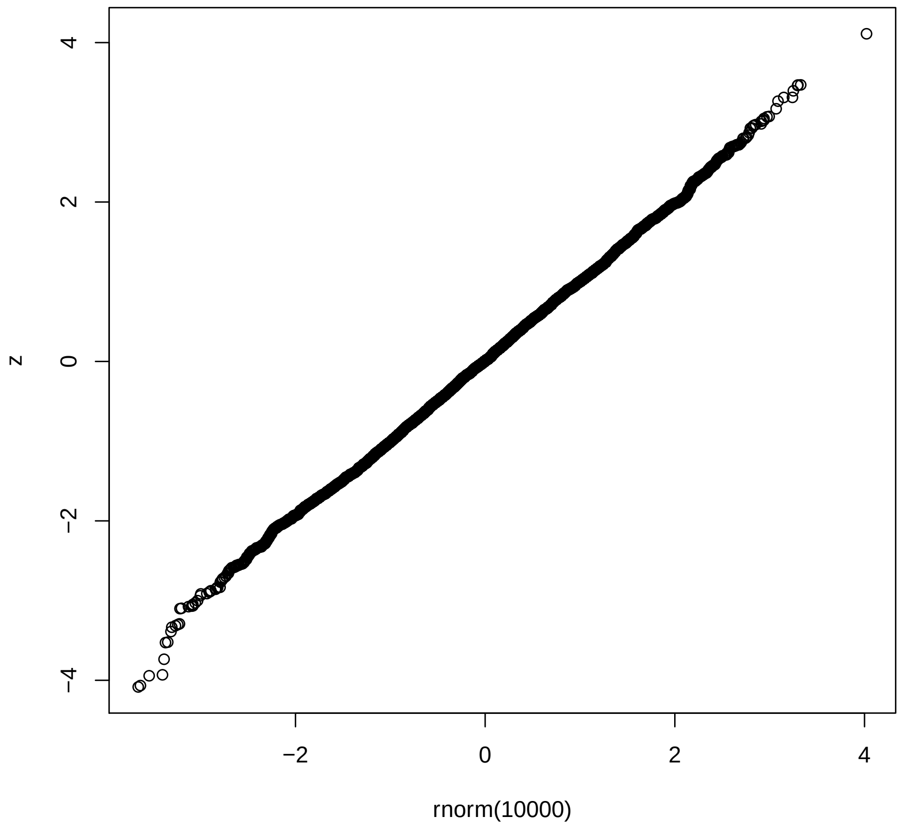

```r
summary(z)

##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -4.083335 -0.670299  0.010950  0.007372  0.684891  4.110678

boxplot(z)
```




```r
hist(rnorm(10000))
```




```
qqplot(rnorm(10000),z)
```



Part 2:

We can obtain the acceptance ratio from the following formula:

$$\sum_y P(Accept \mid y)P(Y=y) = \sum_y \frac{f(y)}{cg(y)}g(y) = \frac{1}{c}$$

Since c value for generated normal variant from Cauchy is 1.52 then the acceptance ratio is $= 1/1.52$.

Part 3:

Acceptance ratio is $\propto$ to the ration of the area of functions. Since Cauchy distribution better fit on Normal distribution than Laplace distribution, We can say that the acceptance rate of Cauchy is better than Laplace. Therefore, Cauchy is better for generating random normal variants.