Assignment 3
Computer simulation course

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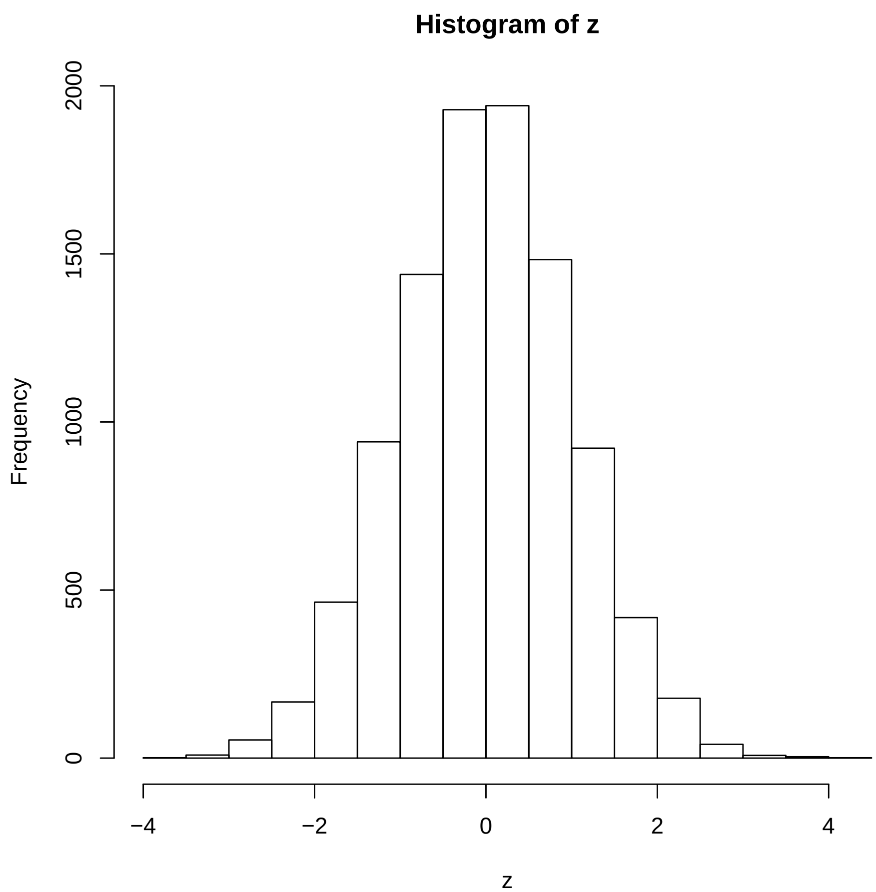
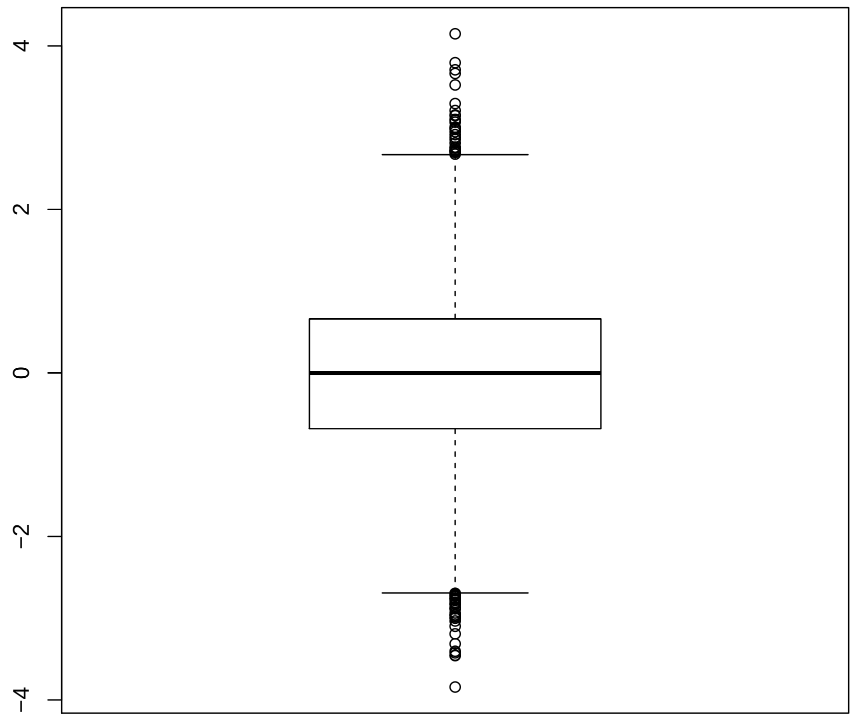
Part 1:

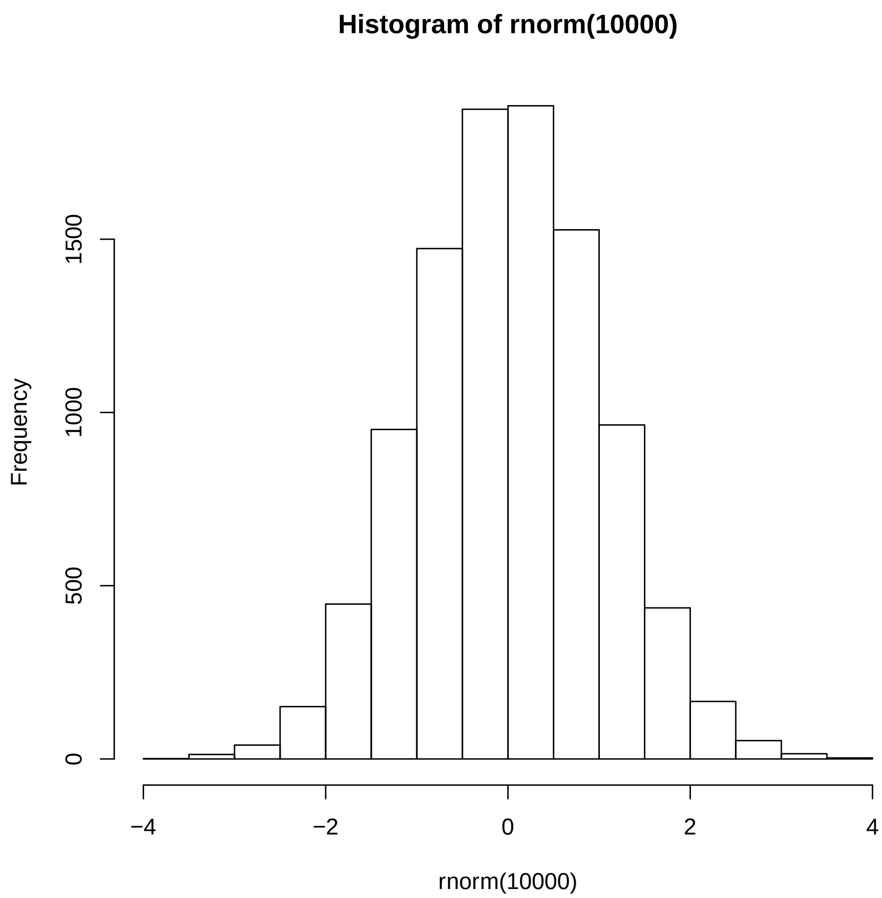
```
f <- function(x) dnorm(x)
g <- function(x) dcauchy(x)

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]  0.08927913  0.80090302 -0.88038752  1.72901491 -0.59870490  1.59543727
##  [7] -0.81476802  1.55059858 -1.55321935  0.66105800

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



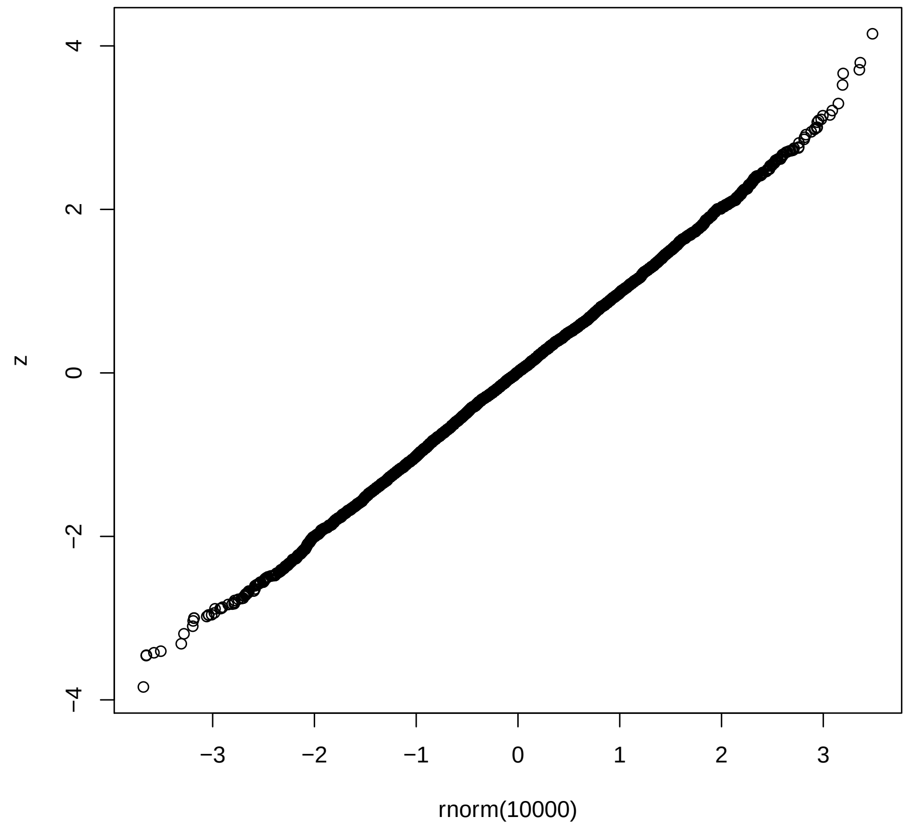

```r
summary(z)

##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.841820 -0.682197 -0.000795 -0.007405  0.660310  4.148733

boxplot(z)
```




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




```r
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 $\propto totherationoftheareaoffunctions.SinceCauchydistributionbetterfitonNormal$