Homework1_Question1

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Question 1

Objective

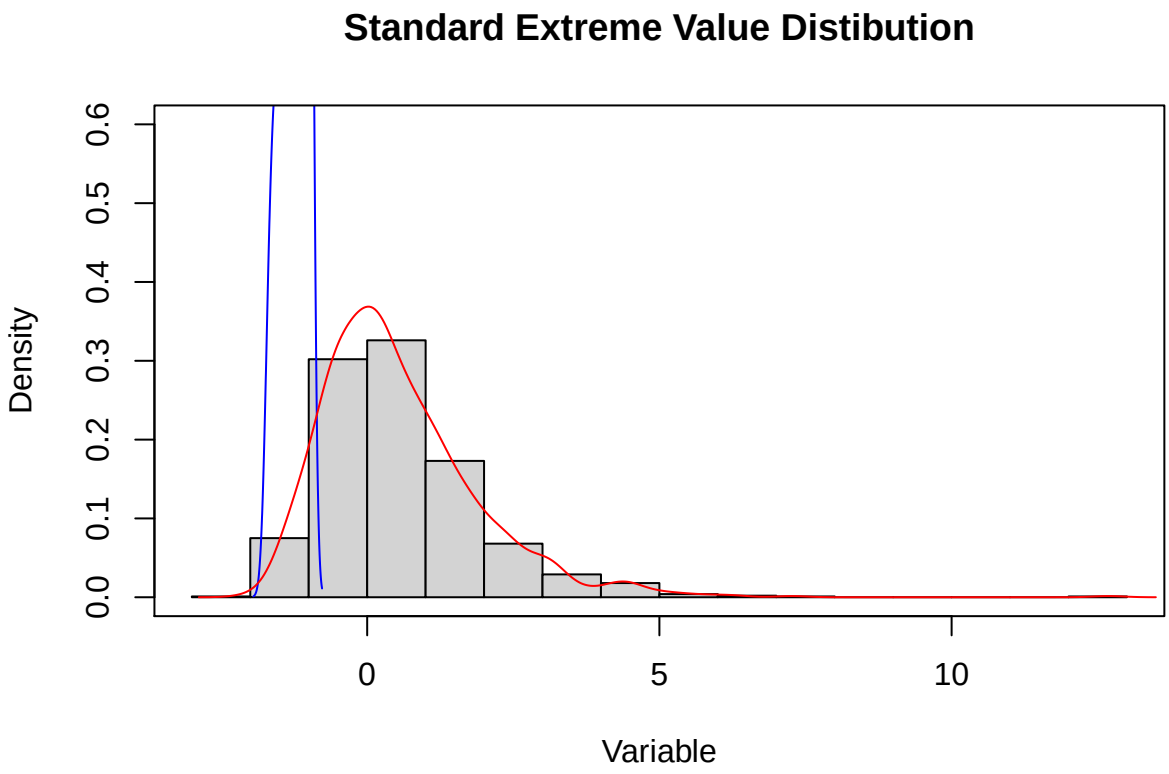
The goal of this problem is to find the inverse CDF of the given density:

$$f_X(x) = exp(x - e^x)$$

This will be done by creating an algorithm to simulate the standard extreme value distribution. For this we will use a normal distribution based on the equation above and then use inverse CDF approach to simulate the standard extreme value distribution.

```
u <- 0
B <- 1
n <- 1000 #sample number
U1 <- runif(n, 0, 1) #Random Number Generator, numbers are evenly distributed between 0 and 1
```

```
f <- function(x){x - exp(x)}#the standard extreme value distribution density function
q <- function(U1){u - B * log(-log(U1))}#inverse of the standard extreme value distribution density fun
#histogram of simulated data
hist(q(U1), prob = TRUE, main = "Standard Extreme Value Distibution", ylim = c(0,0.6), xlab = "Variable
x <- seq(0, 1, 0.01)
lines(density(f(x)), col = "blue") #density curve of f(x)
lines(density(q(U1)), col = "red") #density curve of f(x)
box()
```


Standard Extreme Value Distibution
Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0
5
10
Variable

Question 2

The objective of question 2 is to develop an algorithm to simulate the Rayleigh distribution. This will be in the form of a function with two inputs: the sample size as n and the scale parameter as σ.