Lab5

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1. You need to define a function with 3 arguments, sample size n, location parameter μ, and the scale parameter σ.

```
#Creates a function f which represents the (standard) half normal pdf (unnecessary but makes function l
f <- function(x){
  fx <- (2/(sqrt(2*pi)))*exp(-(x^2)/2)
  return(fx)
}



#Creates a function g which represents the exponential pdf with rate of 1 (unnecessary but makes functi
g <- function(x){
  gx <- exp(-x)
  return(gx)
}




#Creates a function normsim (normal simulation) with inputs n (sample size), mu (mean or location), sig
normsim <- function(n, mu, sigma){

  #Creates a numeric vector of length n, temporarily with 0's
  x <- numeric(n)
  #Sets c as the supremum of of f(x)/g(x)
  c = (2/(sqrt(2*pi)))*exp(1/2)

  #Runs a loop where i is the placeholder starting with 1, and represents the position of x, and the lo
  i = 1
  while(i <= n){
    #Each loop generates a new u value from a random uniform distribution between 0 and 1 and a new y f
    u <- runif(1, min = 0, max = 1)
    y <- rexp(1, rate = 1)
    #If the condition is not met, then this value of y is "rejected, and the while loop is run again fo
    if(u < f(y)/(g(y)*(c))){
      x[i] <- y
      i = i+1
    }
    #Once every position of x has a value, i will be equal to n+1 and the loop will finish
  }

  #n values are randomly generated from a uniform distribution between 0 and 1 and storeed in u.sign.
  u.sign <- runif(n, min = 0, max = 1)
  S <- ifelse(u.sign>0.5,-1,1)

  #multiplying x by S evenly distributes the values as negative and positive
```

```r
  x <- x*S

  #multiplying x by sigma spreads the values out by that scale, and adding mu shifts the location
  x <- x*sigma + mu

  #returns x
  return(x)
}
```

2. Simulate data with sample size $n = 200$, location parameter $\mu = 5$, and the scale parameter $\sigma = 3$ by using the function you defined in 1. And add the normal density curve to it.

```r
#Creates a histogram to show distribution of the values created by the normal simulation function with
hist(normsim(200,5,3),probability = TRUE, xlab = "x", main = "Distribution of Simulation with Normal cu
#Adds the normal curve with a mean of 5 and standard deviation of 3 on top of histogram
curve(dnorm(x,5,3), from = -4, to = 14, add = TRUE)
```