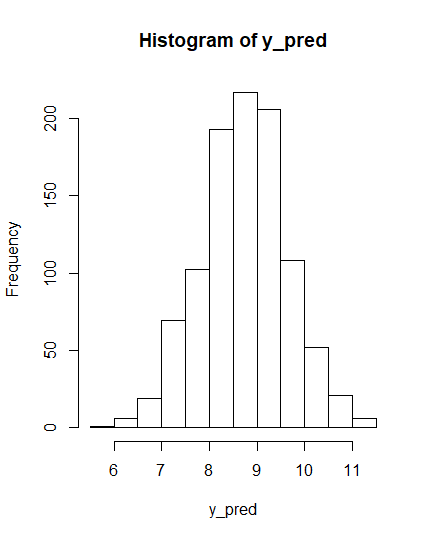
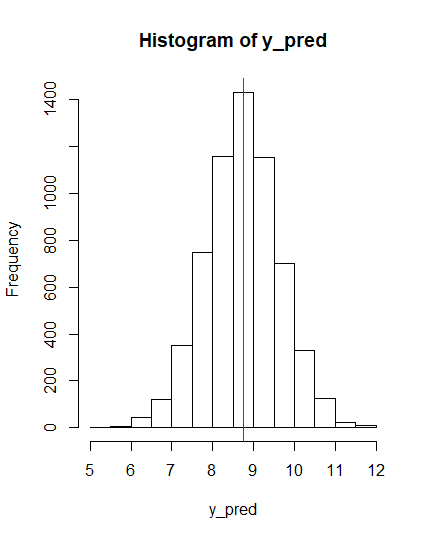
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Professor Hu

MATH 347 - 51  
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Lab 2

1. Exact solution: 0  
   Approximation by Monte Carlo: 0
2. Exact solution:   
   Lower bound is 8.725507  
   Upper bound is 8.77  
     
   Approximation by Monte Carlo:  
   Lower bound is 8.728969  
   Upper bound is 8.765969
3. 
4. Prob(ȳ > ȳS | y) = 0.521  
   1 - Prob(ȳ > ȳS | y) = 0.479  
   

R code:

CEdata <- read.csv(file="C:/Users/Gorge-PC/Downloads/CEdata.csv", header=TRUE, sep=",")

CEdata$LogTotalExpLastQ = log(CEdata$TotalExpLastQ)

mu\_0 = 5

sigma\_0 = 1

phi\_0 = 1/sigma\_0^2

ybar = mean(CEdata$LogTotalExpLastQ)

phi = 1/var(CEdata$LogTotalExpLastQ)

n = 6208

mu\_n = (phi\_0\*mu\_0+n\*phi\*ybar)/(phi\_0+n\*phi)

sd\_n = sqrt(1/(phi\_0+n\*phi))

### question 1

1 - pnorm(9, mu\_n, sd\_n)

set.seed(123)

S = 1000

sum(rnorm(S, mu\_n, sd\_n)>9)/S

### question 2

qnorm(0.025, mu\_n, sd\_n)

qnorm(0.975, mu\_n, sd\_n)

quantile(rnorm(S, mu\_n, sd\_n), c(0.05, 0.95))

### question 3

sample\_sd = sd(CEdata$LogTotalExpLastQ)

mu\_post = rnorm(S, mu\_n, sd\_n)

y\_pred = rnorm(S, mu\_post, sample\_sd)

hist(y\_pred)

###question 4

y\_pred\_matrix = matrix(rep(NA, S\*n), ncol = n)

for (s in 1:S){

mu\_post = rnorm(1, mu\_n, sd\_n)

y\_pred = rnorm(n, mu\_post, sample\_sd)

y\_pred\_matrix[s,] = y\_pred

}

ybar\_sample = rowMeans(y\_pred\_matrix)

hist(y\_pred)

abline(v=ybar, col = "red")

sum(ybar > ybar\_sample)/s

1 - sum(ybar > ybar\_sample)/s