

Part B

My steps for Gibbs Sampler would be:

- First import the data (Y_i), then assign some variable to the data (Y).
- Get the count of the data and assign a variable (n).
- Assign the number of simulations to a variable. (S)
- Create a matrix(samples) or list to hold my various $P(\sigma^2|Y_i, b)$ and $P(b|\sigma^2, y_i)$
- Assign initial values for σ^2 (sigma) and b (B), to any values which eventually converge.
- Assign a and b from prior.
- Loop from 1 to S with inner loop from 1 to n over $P(\sigma^2|Y_i, b)$ for each y_i .
- Also within the loop from 1 to S , pass values generated from each iteration in previous bullet point into $P(b|\sigma^2, y_i)$
- Store these values generated from each iteration into matrix samples.

Part C

```
library(invgamma)

#yi
Y<- c(1:10)

#n
n<- length(Y)

# of simulations
S<- 25000

samples<- matrix(NA, nrow = S, ncol = 11)

#names to assign to matrix
colnames(samples)<- c("s1", "s2", "s3", "s4", "s5", "s6", "s7", "s8", "s9",
```

```

"s10", "B")

#initital values
sigma <- 1
b<- .1

#assign by Dr Reich
a<- 1

#Gibbs sampler
for(s in 1:S){
  for(i in 1:n){
    #sigma
    sigma[i] <- 1/(rgamma(1,.5 + a, (Y[i]^2 + 2* b)/2))
  }
  #b
  b <- rgamma(1,n*a + 1, 1+sum(1/sigma))
  samples[s,] <- c(sigma, b)
}

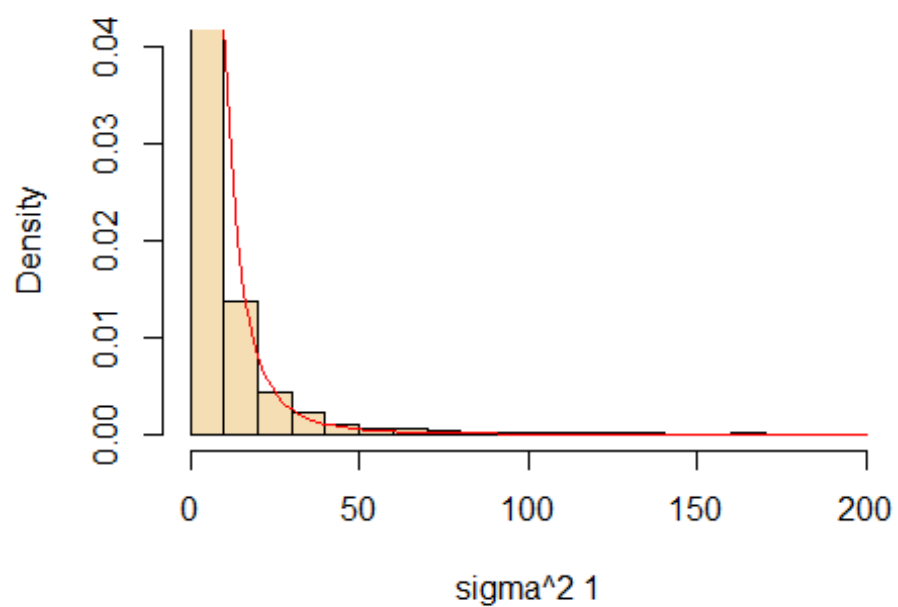
# getting the inverse gamma rate and shape
para<- function(x){
  m = mean(x)
  v = var(x)
  a = (m^2/v) + 2
  b = m * (a- 1)
  return(c(a, b))
}

#Plot of sigma
# op <- par(pty="m", mfrow=c(5, 2), mar=c(4.2, 4.2, 1, 1))
for(i in 1:10){
  temp=samples[,i]
  #selecting only the values less than 200 for hist
  values= temp[temp<200]
  hist(values, freq = F, col = "Wheat", xlab =paste("sigma^2", i), main =
paste("Histogram of sigma^2", i), ylim = c(0, .04))
  x= seq(0, 200, length = length(values))

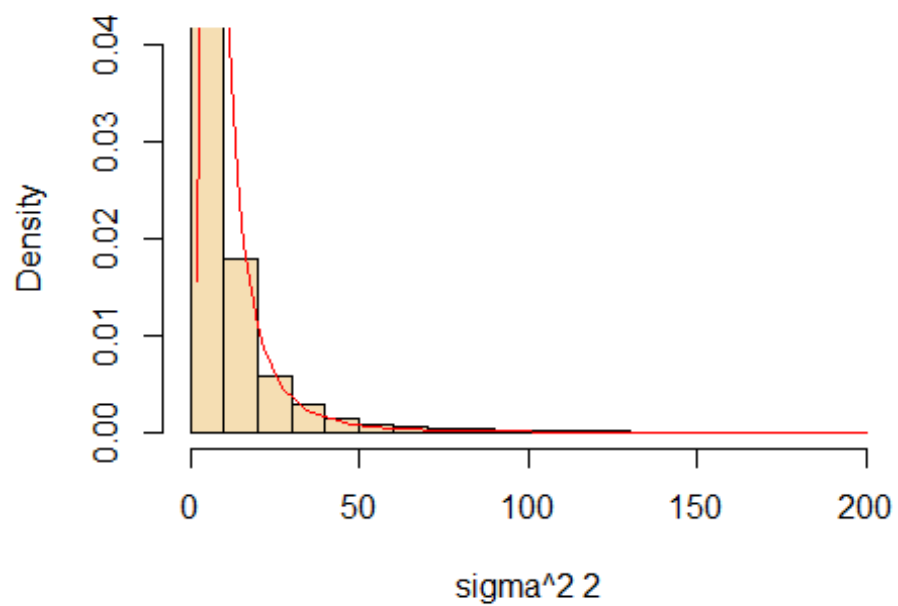
  #gamma distrubtion overlay
  curve(dinvgamma(x,para(values)[1],para(values)[2]), add = TRUE, col =
"red");
}

```

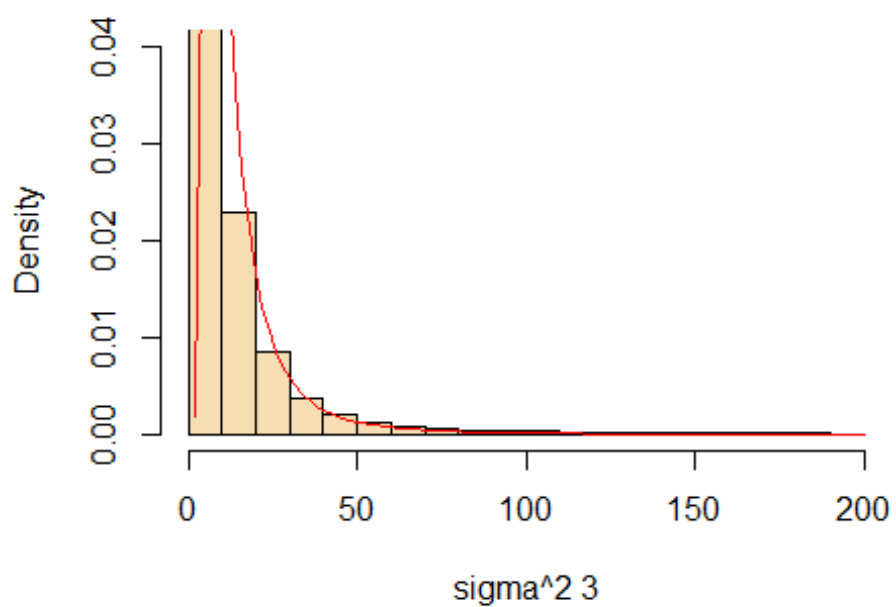
Histogram of σ^2_1



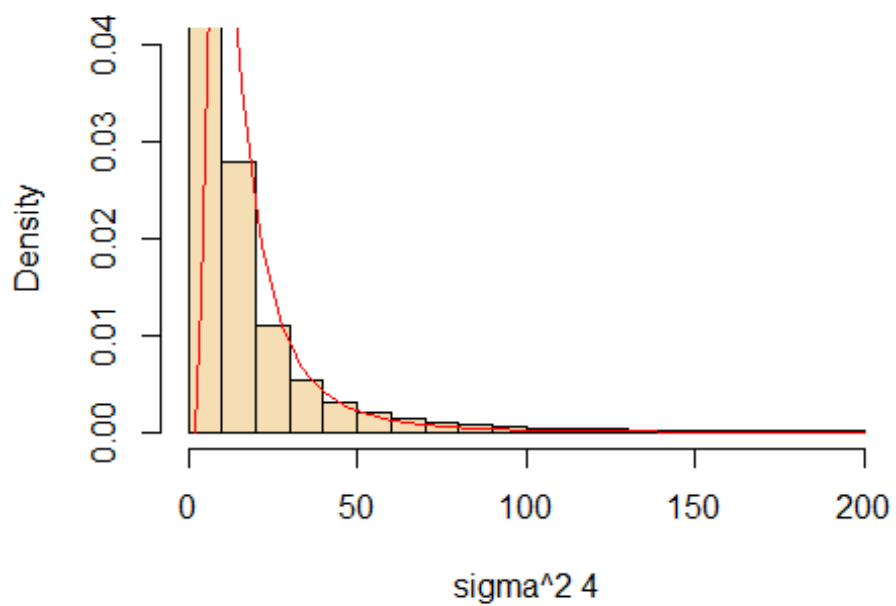
Histogram of σ^2_2



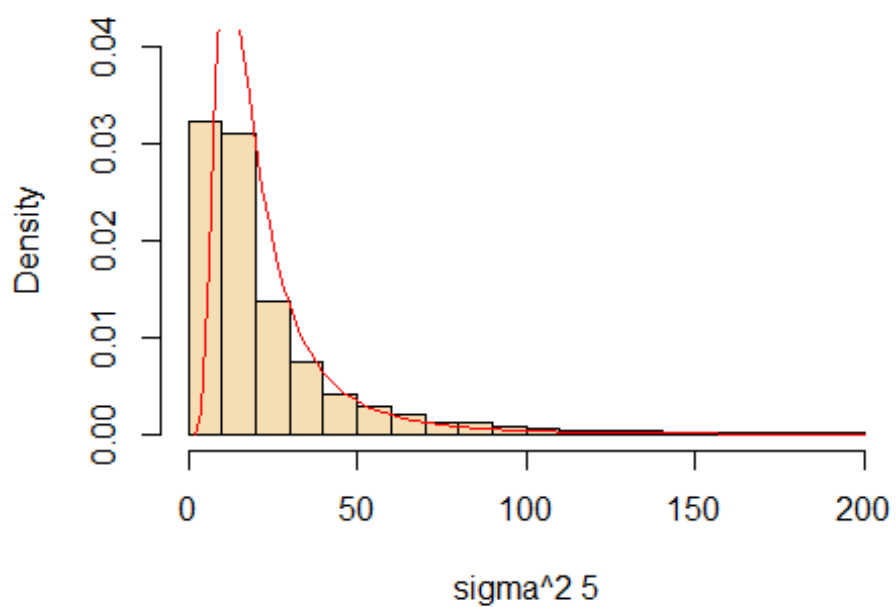
Histogram of σ^2_3



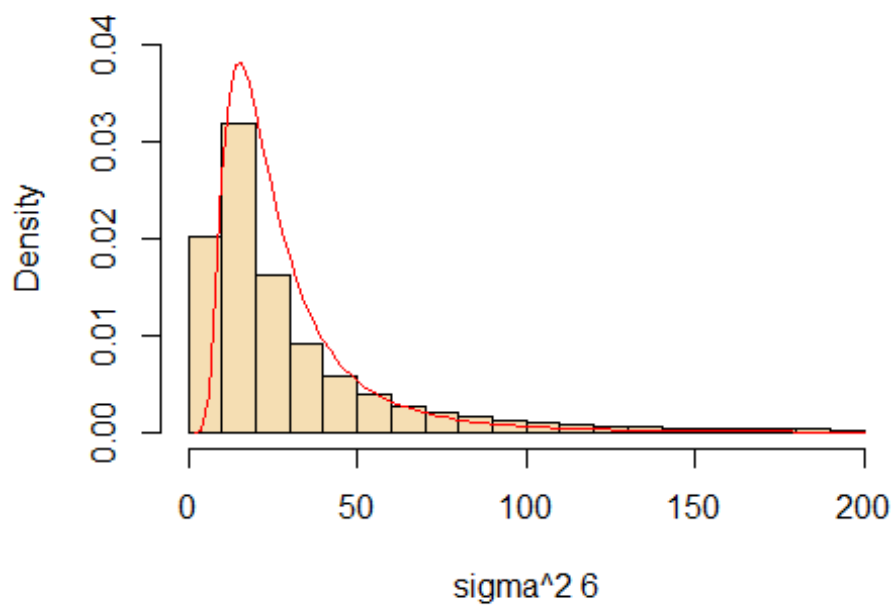
Histogram of σ^2_4



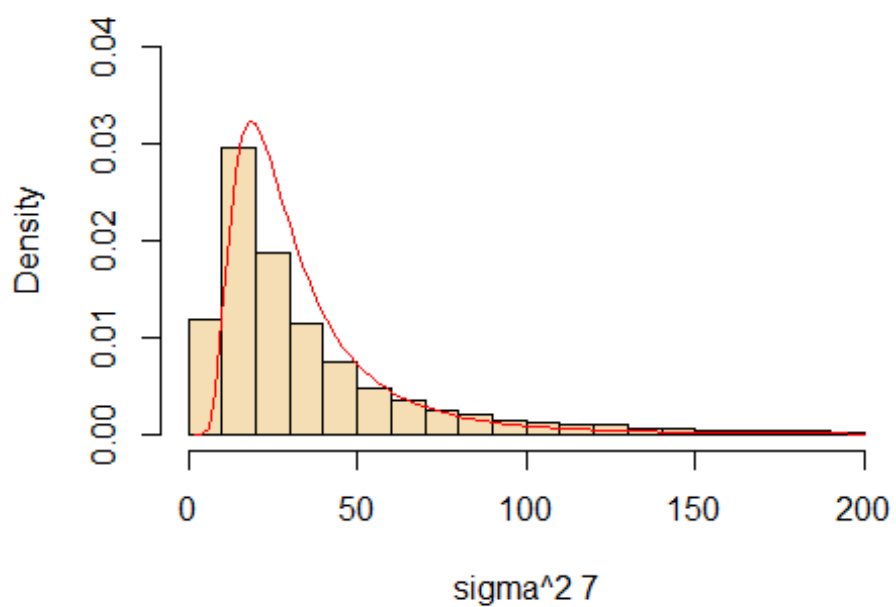
Histogram of σ^2_5



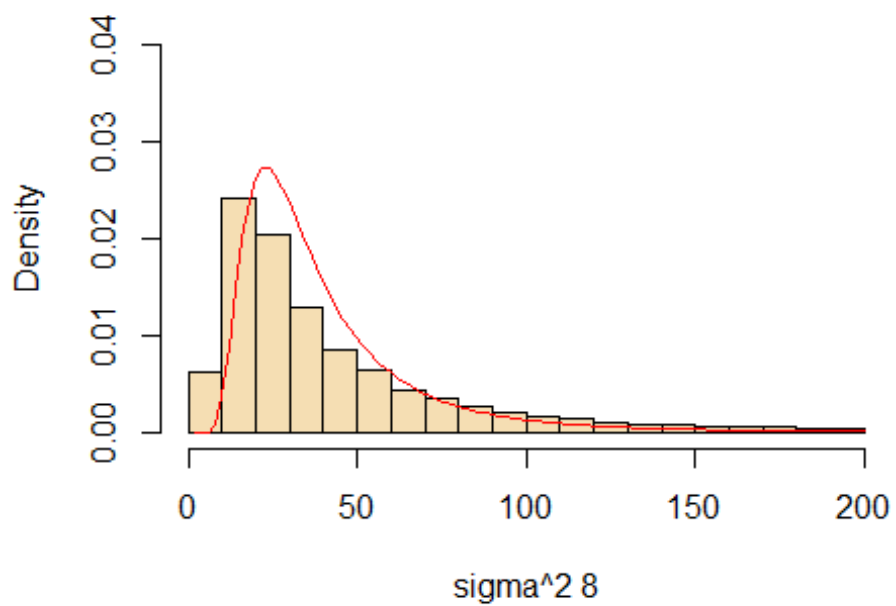
Histogram of σ^2_6



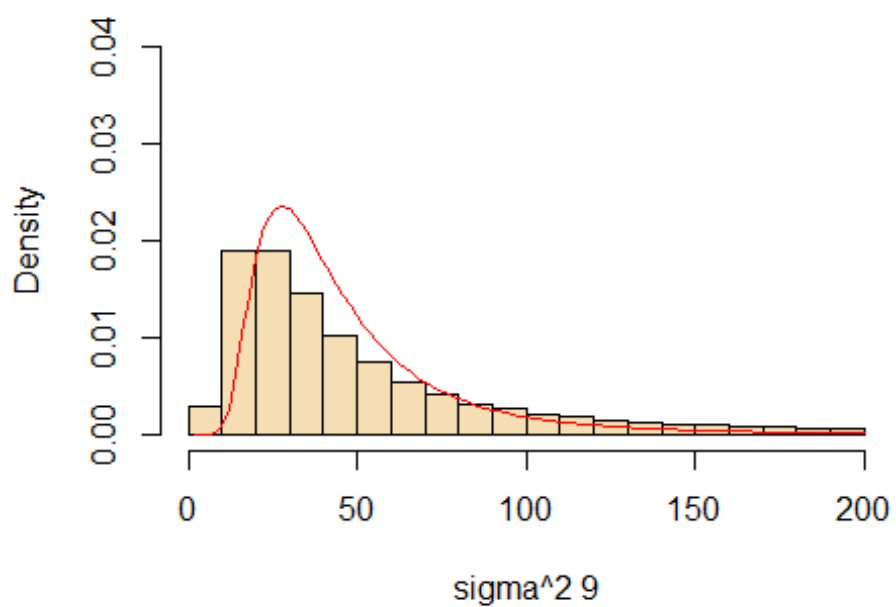
Histogram of σ^2_7



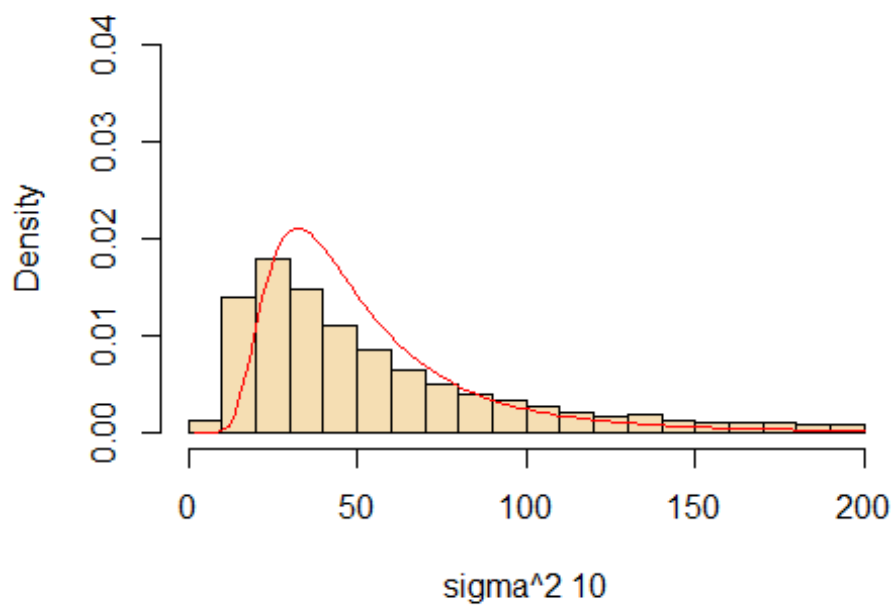
Histogram of σ^2_8



Histogram of σ^2_9



Histogram of σ^2_{10}



```
# par(op)
```

```
#histogram of B  
hist(samples[,11], freq = F, col = "wheat", main = "Histogram of b")
```

