**R Code for HW 1**

#Problem 4

#Part 2

theta<-c(0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0)

Y<-rep(1,11)

for(i in 1:11)

  Y[i]<-choose(100,57)\*(theta[i]^57)\*(1-theta[i])^43

print(Y)

plot(theta, Y, type = "h", main = "Problem 4, Part 2", xlab = expression(paste(theta)),

     ylab="Pr(Y=57 | theta)")

#Part 3

x<-rep(1,11)

x1<-rep(1,11)

for(i in 1:11)

  x[i]<-(choose(100,57)\*(theta[i]^57)\*(1-theta[i])^43)\*(1/11)

NormConstant<-1/(sum(x))

x1<-x\*NormConstant

print(x1)

plot(theta, x1, type = "h", main = "Problem 4 Part 3", xlab = expression(paste(theta)),

     ylab = "Posterior")

#Part 4

f<-curve(choose(100,57)\*x^57\*((1-x)^43), from = 0, to = 1, main = "Problem 4, Part 4",

         xlab = expression(paste(theta)), ylab = "posterior")

#Part 5

v<-seq(0, 1, length = 200)

z<-dbeta(v, 58, 44)

plot(v, z, type = "l", main = "Problem 4, Part 5 Beta(58,44) Distribution",

     xlab = expression(paste(theta)), ylab = "Posterior")

#Problem 5

theta\_0<-c(0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9)

n\_0<-c(1,2,8,16,32)

a<-matrix(0L, nrow =length(theta\_0), ncol =length(n\_0))

b<-matrix(0L, nrow =length(theta\_0), ncol =length(n\_0))

for (i in 1:length(theta\_0))

{for (j in 1:length(n\_0))

{a[i,j]=theta\_0[i]\*n\_0[j]

b[i,j]=(1-theta\_0[i])\*n\_0[j]

}

}

Pr<-matrix(0L, nrow =length(theta\_0), ncol =length(n\_0))

for (i in 1:length(theta\_0))

{for (j in 1:length(n\_0))

{

  f <- function(x)

  {choose(100,57)\*(x^57)\*((1- x)^43)\*(gamma(a[i,j]+b[i,j])/

                      (gamma(a[i,j])\*gamma(b[i,j])))\*(x^(a[ i,j]-1))\*(1-x)^(b[i,j]-1)}

  bot<-integrate(f,0, 1, rel.tol=1e-10)$value

  top<-integrate(f,0.5, 1, rel.tol=1e-10)$value

  Pr[i,j]<-top/bot

}

}

contour(theta\_0, n\_0, Pr,main = "Problem 5 Countour Plot", xlab=expression(paste(theta)),

        ylab='n\_0')