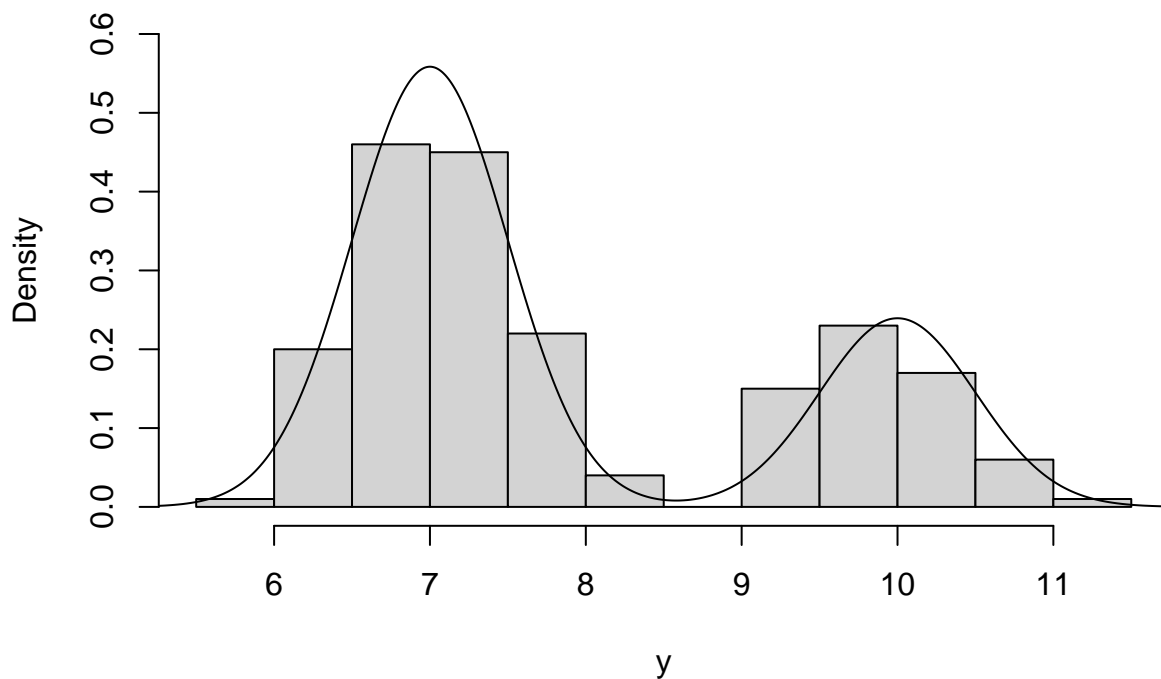# HW8

Zeqiu.Yu

2022-11-21

Homework 8

7.1

(a.)

```r
n <- 200
set.seed(0)
func <- sample(1:2,prob=c(0.7,0.3),size=n,replace=TRUE)
mu <- c(7,10)
sd <- c(.5,.5)
y <- rnorm(n=n,mean=mu[func],sd=sd[func])

x=seq(5,14,by=.01)
d=.7*dnorm(x,7,.5) + .3*dnorm(x,10,.5)
par(mfrow=c(1,1))
hist(y,breaks=20,freq=FALSE,main="Histogram of mixture data with n=200",ylab="Density",ylim = c(0,0.6))
points(x,d,type="l")
```

Histogram of mixture data with n=200

(b.)

```r
## INITIAL VALUES
n = 10000
x.val1 = NULL
set.seed(0)

## FUNCTIONS ##note prior is U(0,1)
f = function(x){prod(x*dnorm(y,7,0.5) + (1-x)*dnorm(y,10,0.5))}
R = function(xt,x){f(x)*g(xt)/(f(xt)*g(x))}

## MAIN
# BETA(1,1) PROPOSAL DENSITY
g = function(x){dunif(x,0,1)}
x.val1[1] = runif(1,0,1)

for(i in 1:n){
     xt = x.val1[i]
     x = runif(1,0,1)
     p = min(R(xt,x),1)
     d = rbinom(1,1,p)
     x.val1[i+1] = x*d + xt*(1-d)
}
mean(x.val1[201:(n+1)])
```
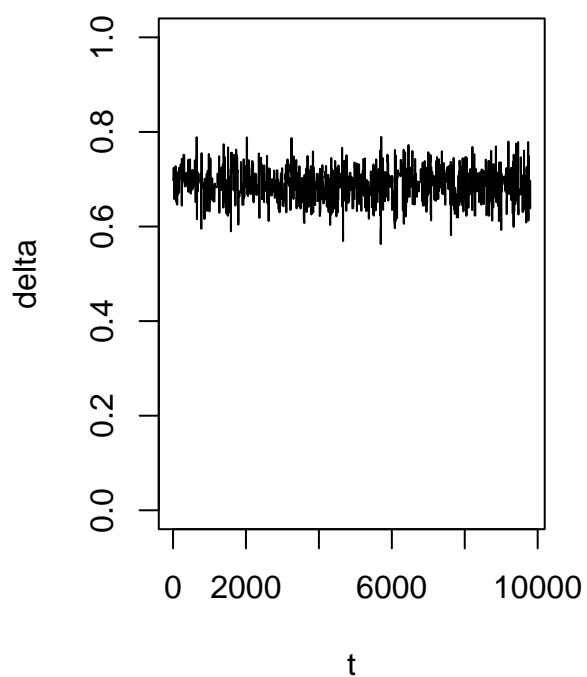
```
## [1] 0.6879803
```

```r
par(mfrow=c(1,2))
plot(x.val1[201:(n+1)],ylim=c(0,1),type="l",ylab="delta",xlab="t")
title("Sample path for U(0,1) Proposal Dist.")
hist(x.val1[201:(n+1)],breaks=20,xlab="delta",
     main="Hist. for U(0,1) Proposal Dist.")
```

Sample path for U(0,1) Proposal D

Hist. for U(0,1) Proposal Dist.

Hence, the expectation of δ is 0.6879803.