Lab1

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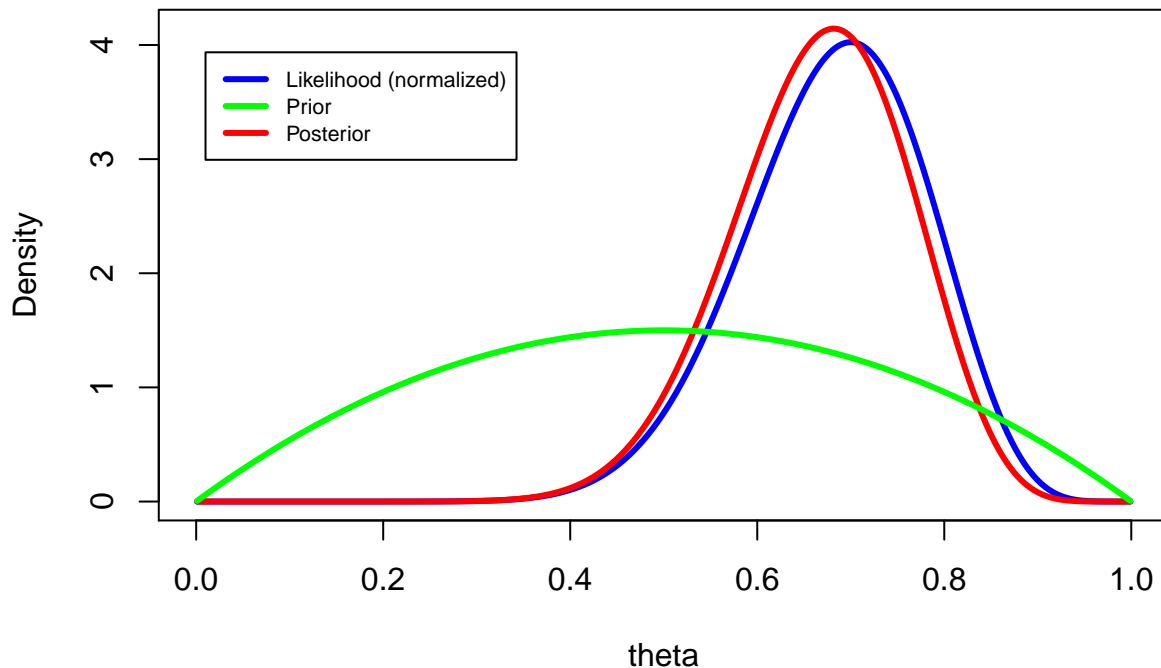
Task 1

a)

For 20 and 10000 draws repectively we get:

```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.0831842107616843"
## [1] "Mean: 0.649507908403323"
```

Bernoulli model – Beta(a,b) prior


```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.0934519716965472"
## [1] "Mean: 0.66659958351529"
```

Posterior mean GT is the value that the posterior distribution mean is converging to.
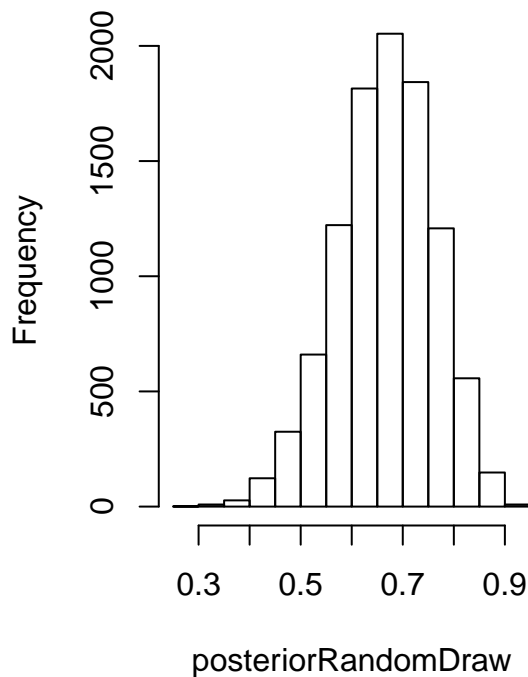
b)

```
## [1] "propability condition with random: 0.0043"
```

```
## [1] "ground truth probability: 0.00397268082810898"
```
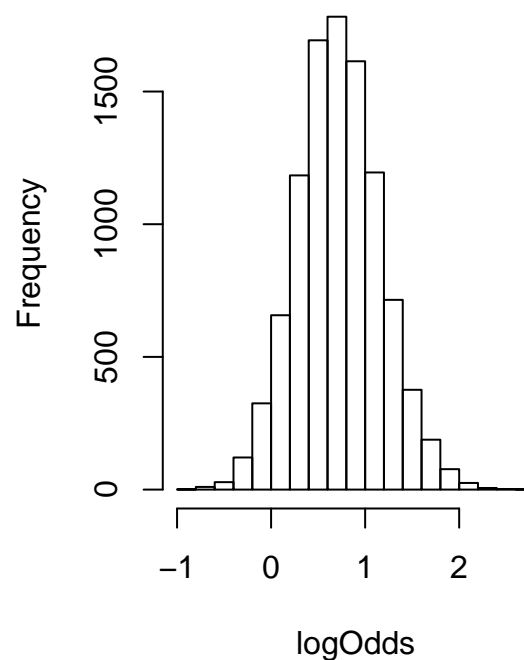
Looking at the plot above, the probability for theta < 0.5|y is very small. The simulated value is relatively close to the ground truth. (Note: The further to the left on the tail, the larger sample we will need as the data points become more sparse.)

c)

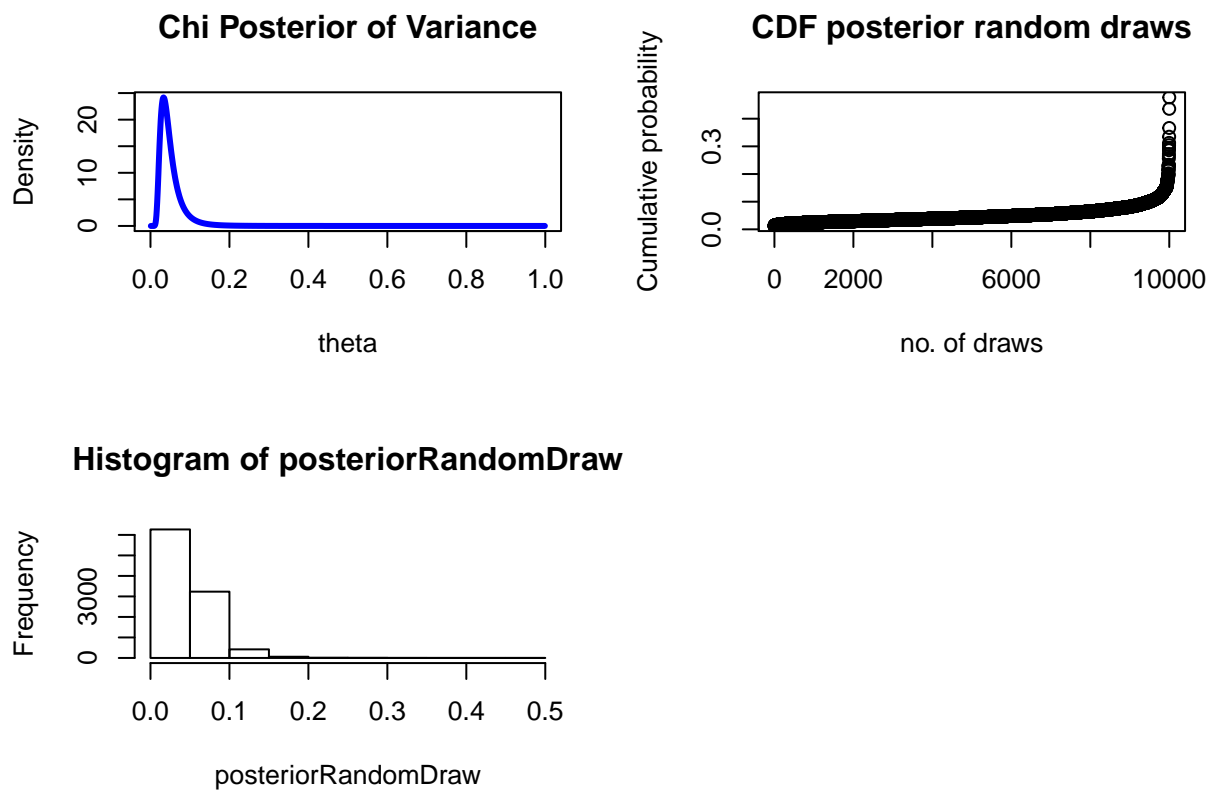**Histogram of posteriorRandomDraw**   **Histogram of logOdds**
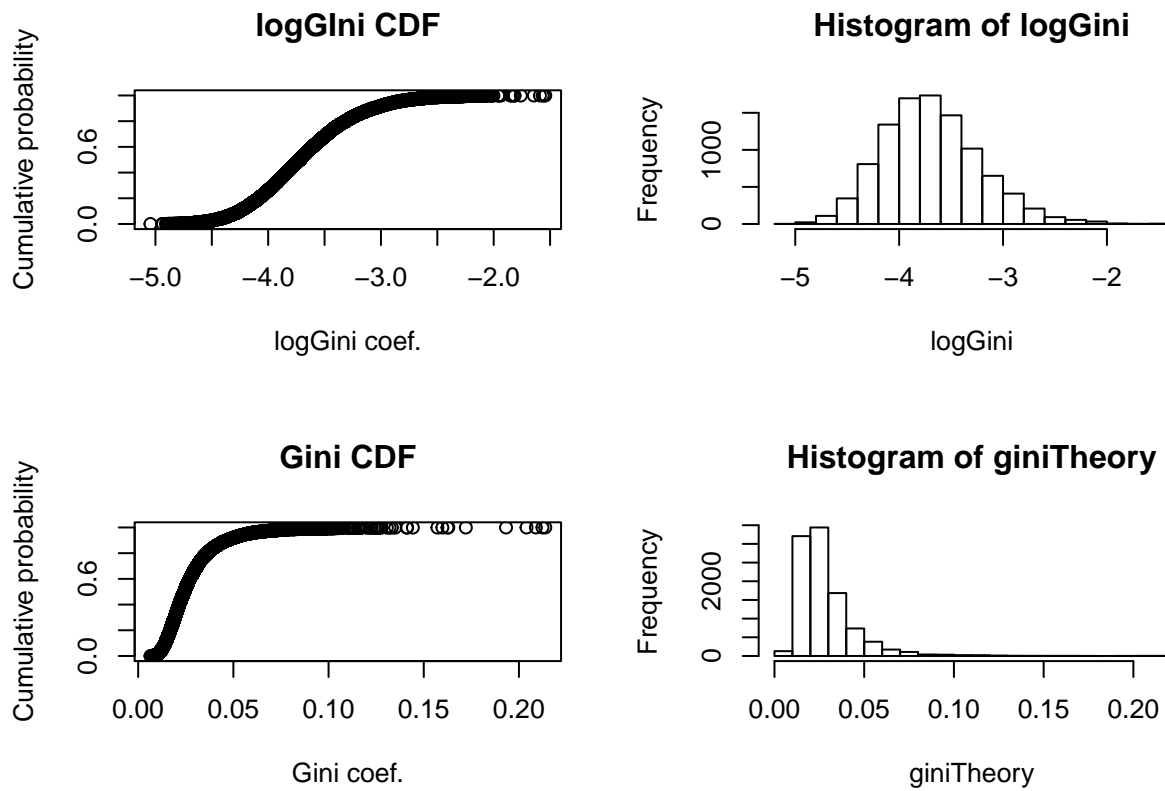
```
##
## Call:
##  density.default(x = logOdds)
##
## Data: logOdds (10000 obs.);  Bandwidth 'bw' = 0.06222
##
##       x                 y
##  Min.   :-1.03885   Min.   :0.0000074
##  1st Qu.:-0.05542   1st Qu.:0.0044034
##  Median : 0.92802   Median :0.0852246
##  Mean   : 0.92802   Mean   :0.2539625
##  3rd Qu.: 1.91145   3rd Qu.:0.4639887
##  Max.   : 2.89489   Max.   :0.9060729
```

Task 2

a

Chi Posterior of Variance

Density

CDF posterior random draws

Cumulative probability

theta

no. of draws

Histogram of posteriorRandomDraw

Frequency

posteriorRandomDraw

b

c

```
## 
## Call:
## 	density.default(x = middleData)
## 
## Data: middleData (9501 obs.);	Bandwidth 'bw' = 0.001559
## 
## 	x                  y
## 	Min.   :0.006288   Min.   : 0.00181
## 	1st Qu.:0.022924   1st Qu.: 3.15179
## 	Median :0.039560   Median : 8.73280
## 	Mean   :0.039560   Mean   :15.01289
## 	3rd Qu.:0.056196   3rd Qu.:27.28671
## 	Max.   :0.072832   Max.   :44.04042
## [1] 0.0109656
## [1] 0.06815388
```

Task 3

a

b