Lab1

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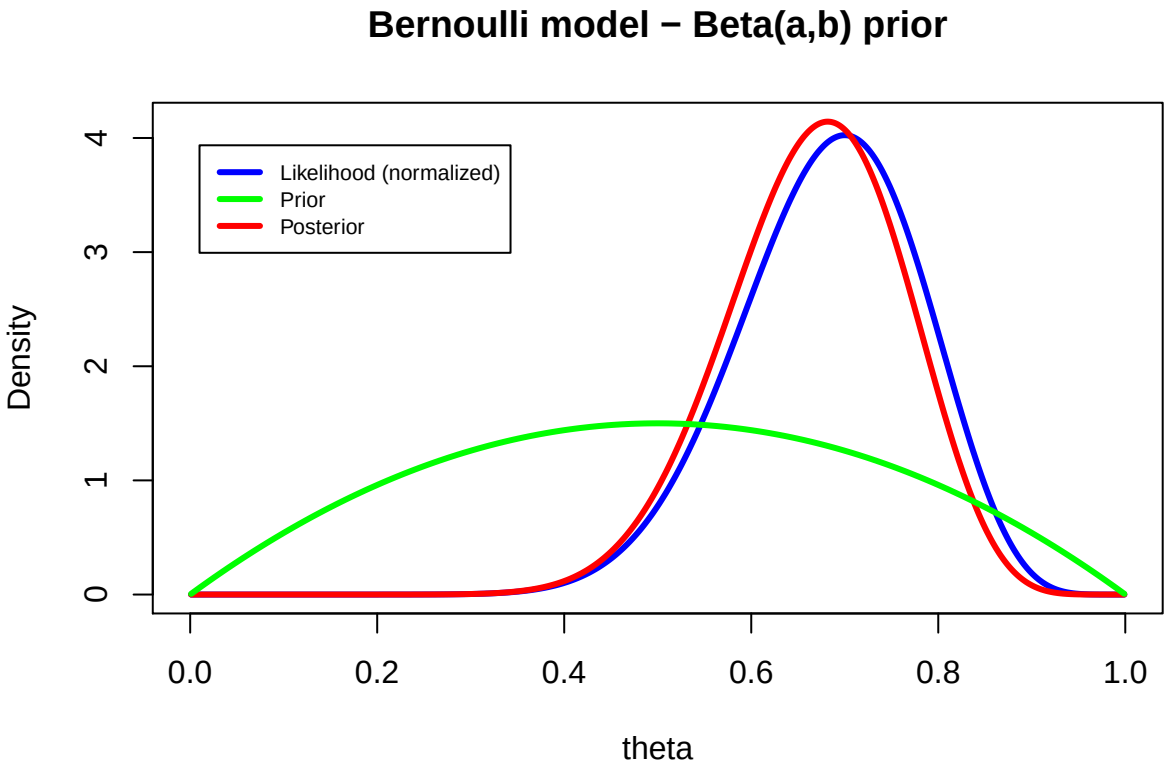
Task 1

a)

For 20 and 10000 draws repectively we get:

```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.0988056099829084"
## [1] "Mean: 0.699077548049409"
```




```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.0937785379420707"
## [1] "Mean: 0.666249741381255"
```

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

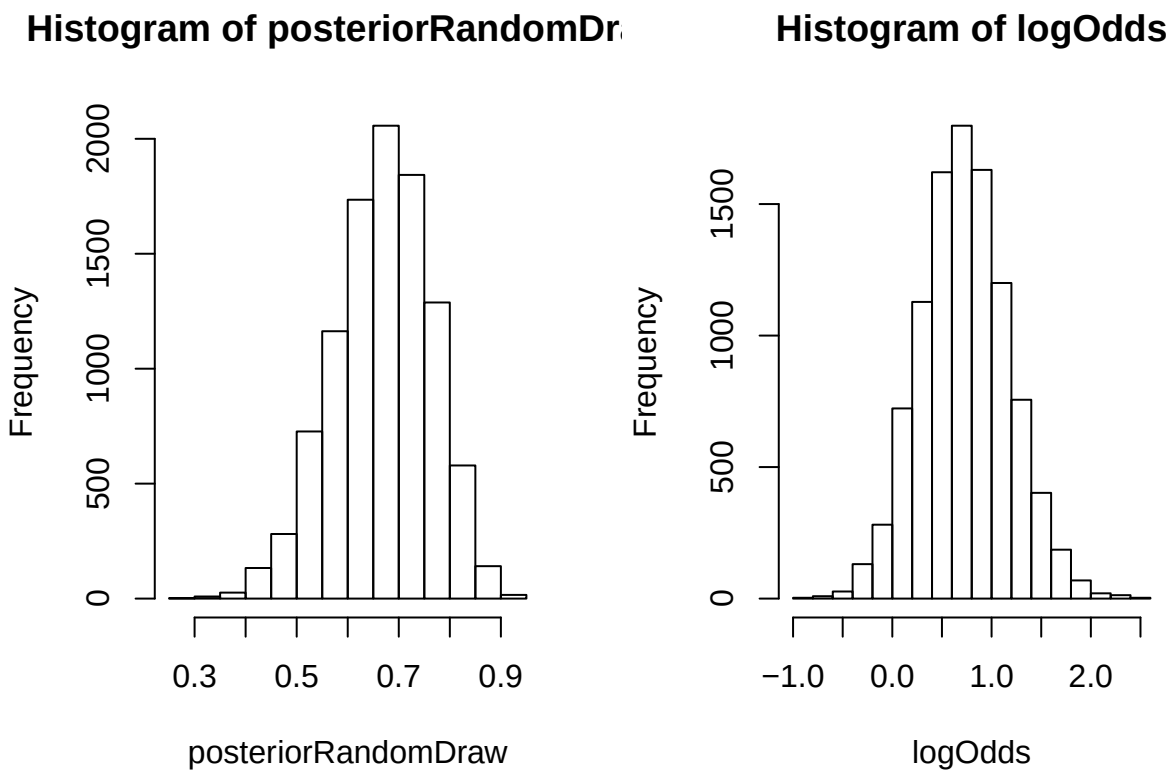
b)

```
## [1] "propability condition with random: 0.004"
```

```
## [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.)

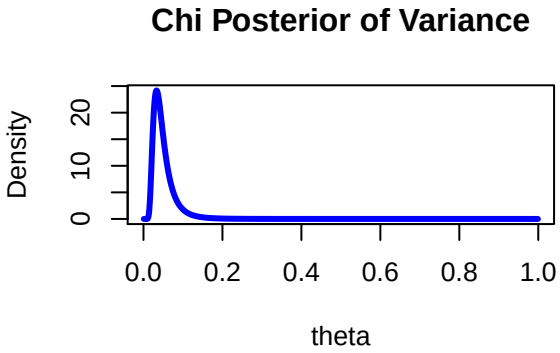
c)

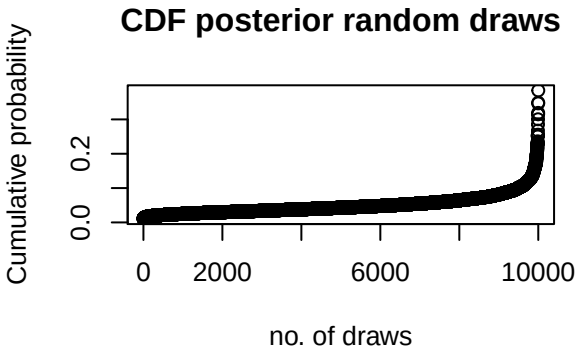


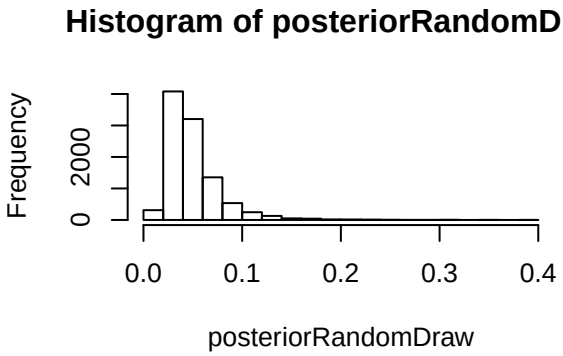

```
##
## Call:
##  density.default(x = logOdds)
##
## Data: logOdds (10000 obs.);  Bandwidth 'bw' = 0.06334
##
##        x                 y
##  Min.   :-1.1244   Min.   :0.0000075
##  1st Qu.:-0.1537   1st Qu.:0.0064825
##  Median : 0.8170   Median :0.0871550
##  Mean   : 0.8170   Mean   :0.2573020
##  3rd Qu.: 1.7877   3rd Qu.:0.4973088
##  Max.   : 2.7583   Max.   :0.8962261
```

Task 2

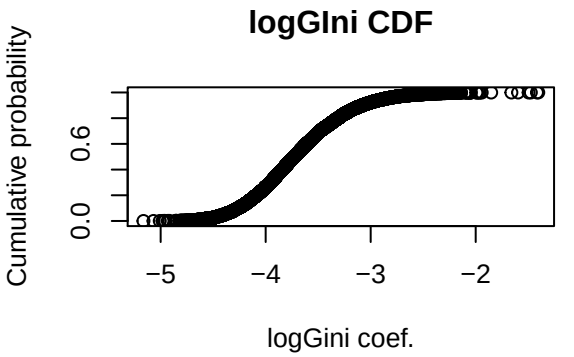
a

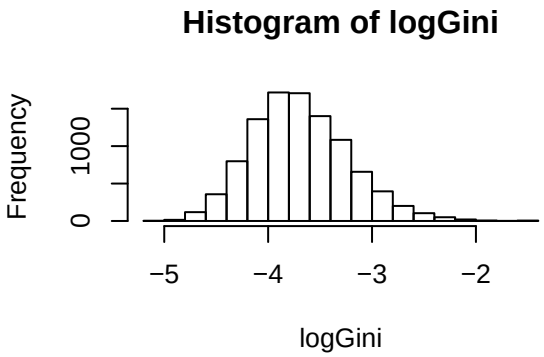

Chi Posterior of Variance
Density
0
10
20
0.0
0.2
0.4
0.6
0.8
1.0
theta

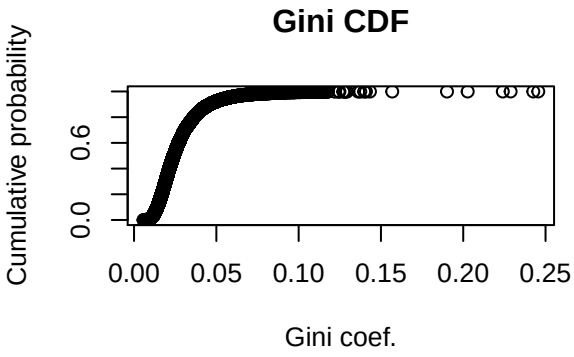

CDF posterior random draws
Cumulative probability
0.0
0.2
0
2000
6000
10000
no. of draws

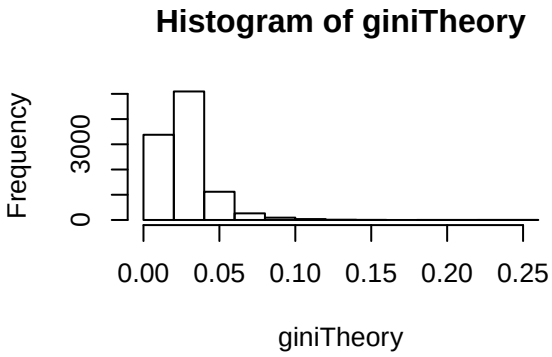

Histogram of posteriorRandomDraw
Frequency
0
2000
0.0
0.1
0.2
0.3
0.4
posteriorRandomDraw

b







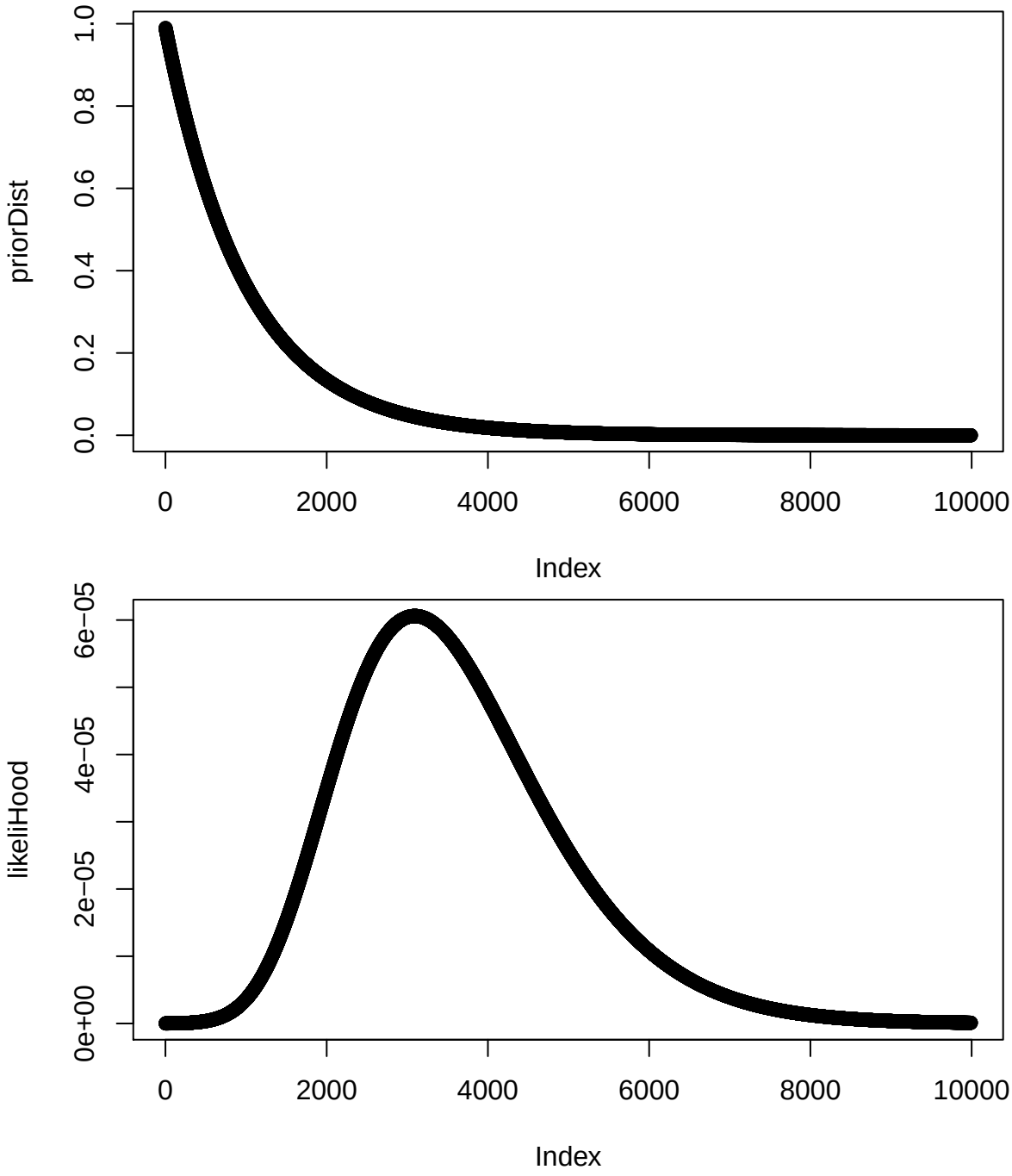


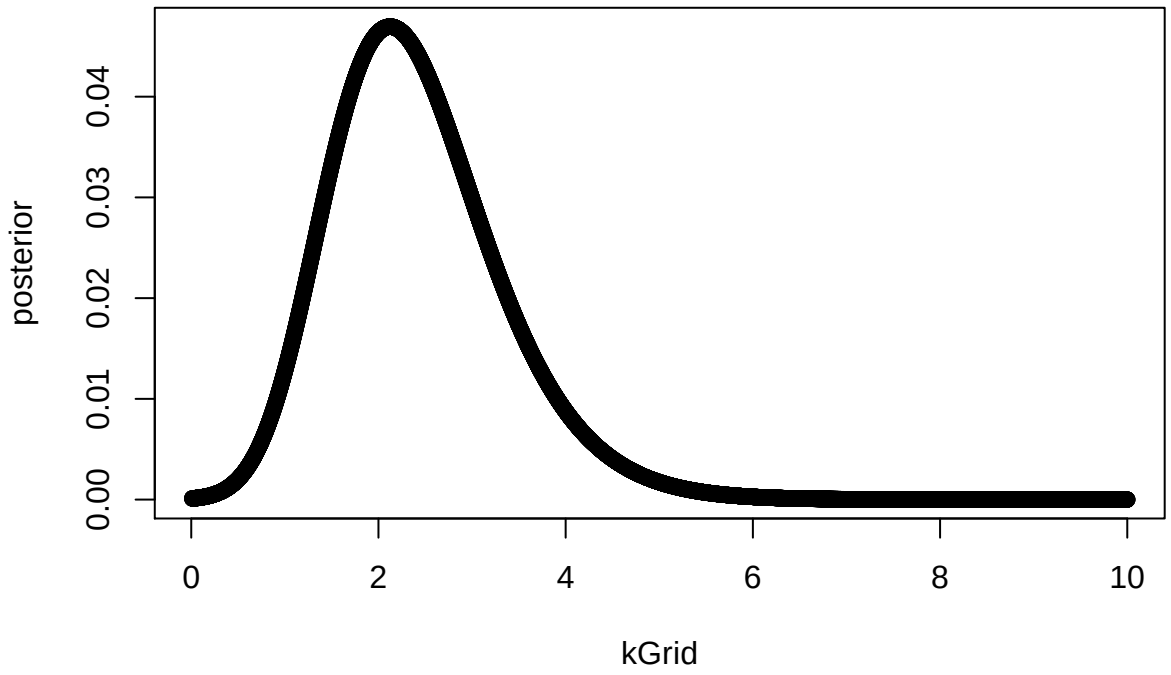
c

```
##
## Call:
##  density.default(x = middleData)
##
## Data: middleData (9501 obs.);    Bandwidth 'bw' = 0.001596
##
##        x                  y
##  Min.   :0.006038   Min.   : 0.00218
##  1st Qu.:0.023226   1st Qu.: 2.63345
##  Median :0.040415   Median : 8.30551
##  Mean   :0.040415   Mean   :14.53012
##  3rd Qu.:0.057604   3rd Qu.:24.82328
##  Max.   :0.074792   Max.   :43.94238
## [1] 0.01082599
## [1] 0.07000372
```

Task 3

a


priorDist
0.0
0.2
0.4
0.6
0.8
1.0
0
2000
4000
6000
8000
10000
Index
likeliHood
0e+00
2e−05
4e−05
6e−05
0
2000
4000
6000
8000
10000
Index




```
## [1] 2.125
```

b