Lab1

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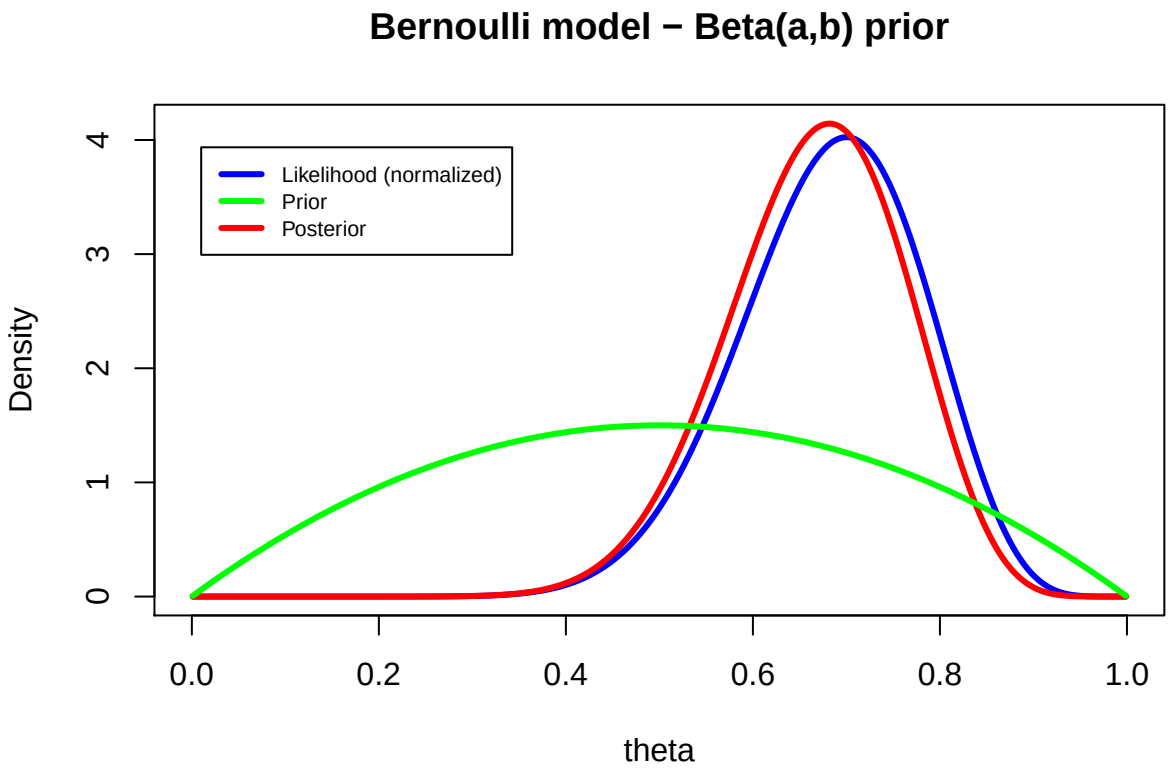
Task 1

a)

For 20 and 10000 draws repectively we get:

```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.113675163504321"
## [1] "Mean: 0.61739179356582"
```




```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.0950340373501573"
## [1] "Mean: 0.665918840783175"
```

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

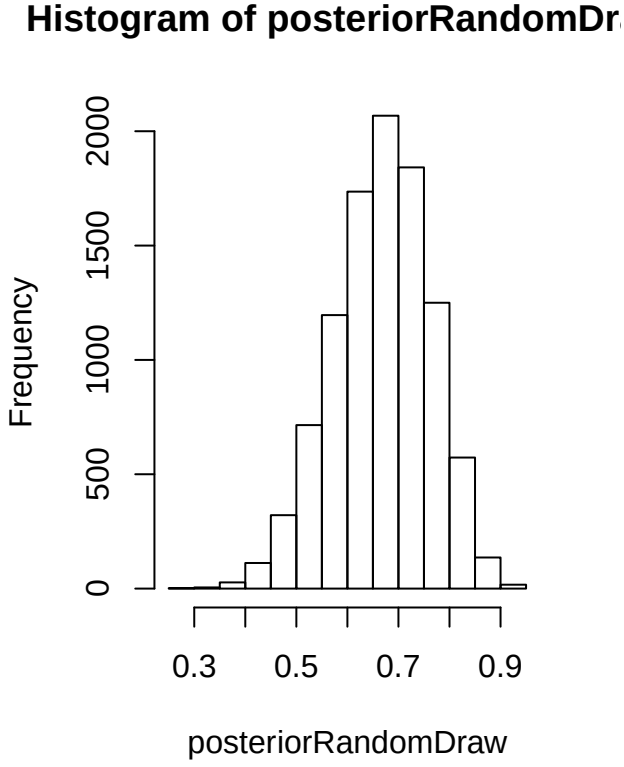
b)

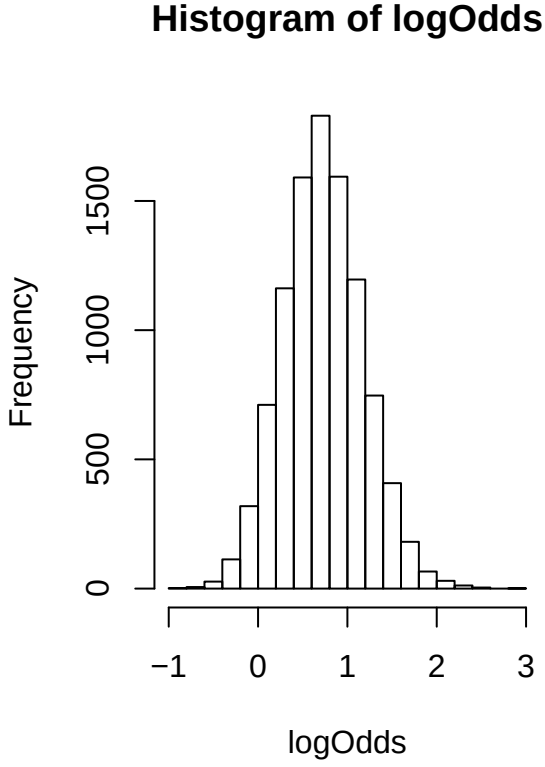
```
## [1] "propability condition with random: 0.0035"
```

```
## [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)

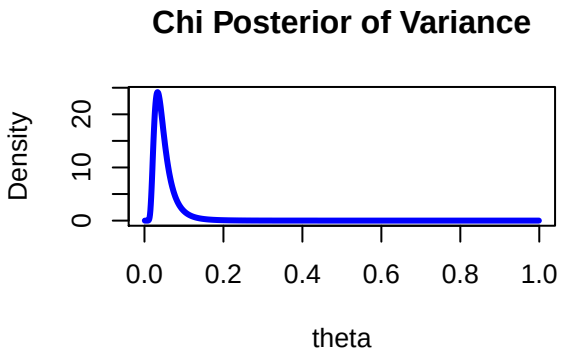


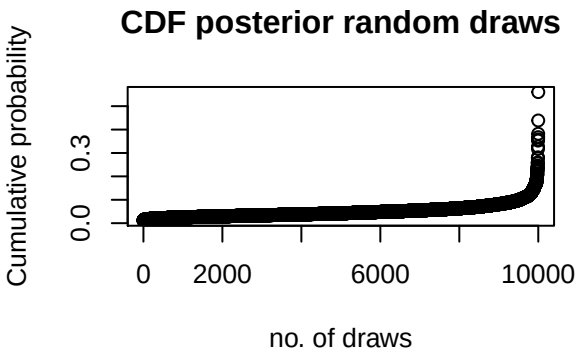


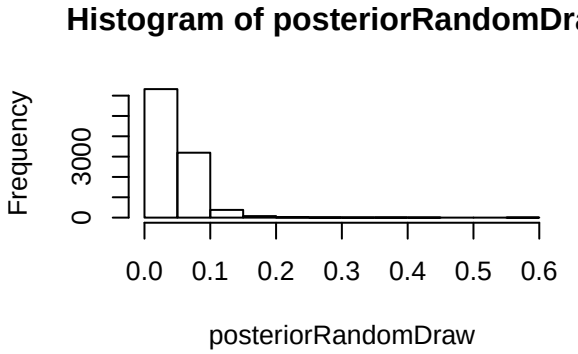

```
##
## Call:
##  density.default(x = logOdds)
##
## Data: logOdds (10000 obs.);  Bandwidth 'bw' = 0.0634
##
##        x                 y
##  Min.   :-1.09961   Min.   :0.0000072
##  1st Qu.:-0.07294   1st Qu.:0.0033152
##  Median : 0.95373   Median :0.0627949
##  Mean   : 0.95373   Mean   :0.2432679
##  3rd Qu.: 1.98040   3rd Qu.:0.4537596
##  Max.   : 3.00707   Max.   :0.9181503
```

Task 2

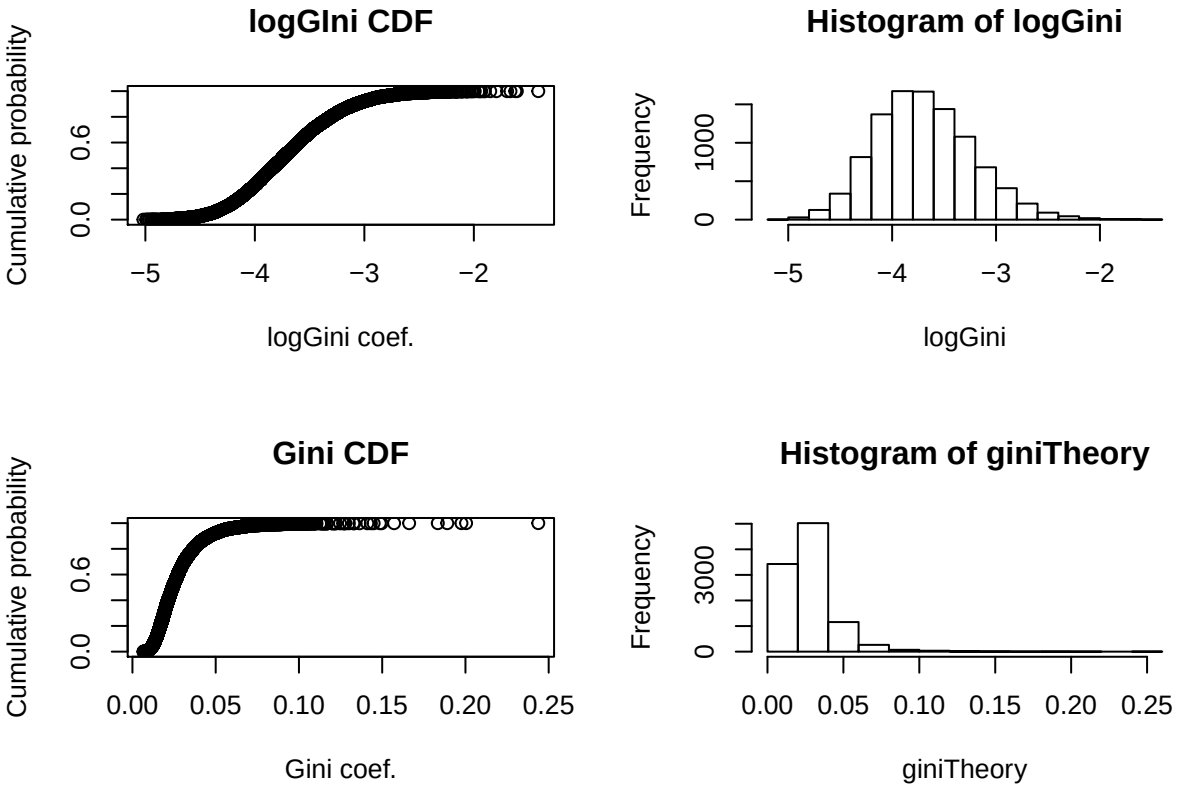
a


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
0.3
0
2000
6000
10000
no. of draws


Histogram of posteriorRandomDraw
Frequency
0
3000
0.0
0.1
0.2
0.3
0.4
0.5
0.6
posteriorRandomDraw

b

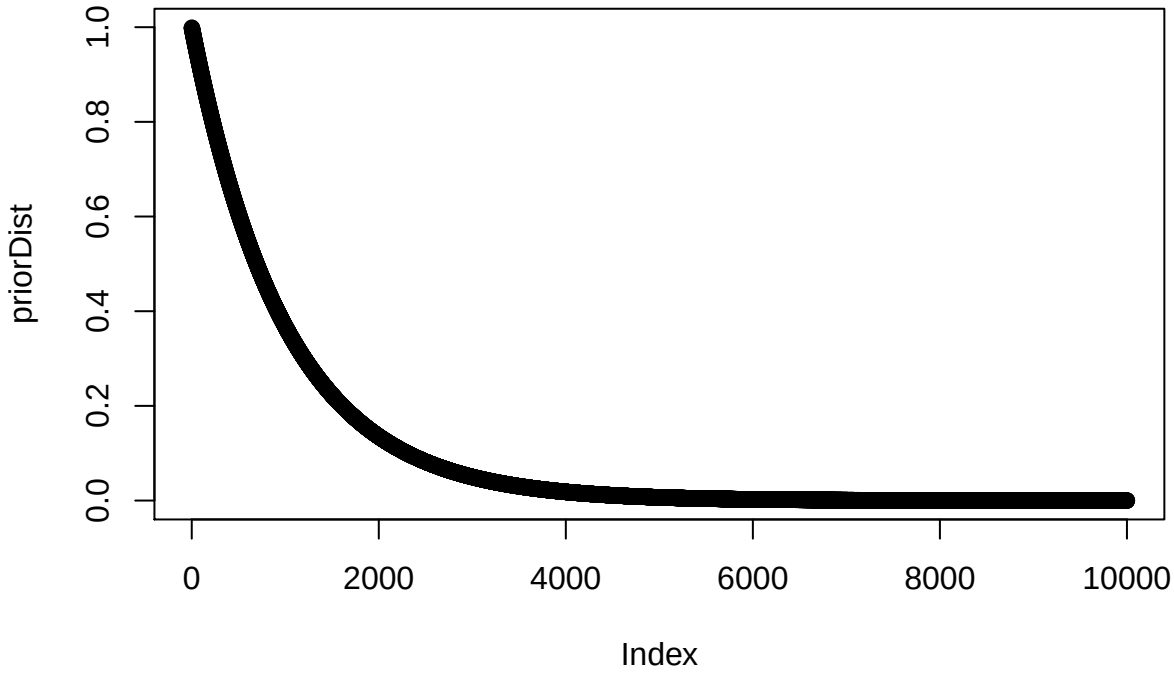


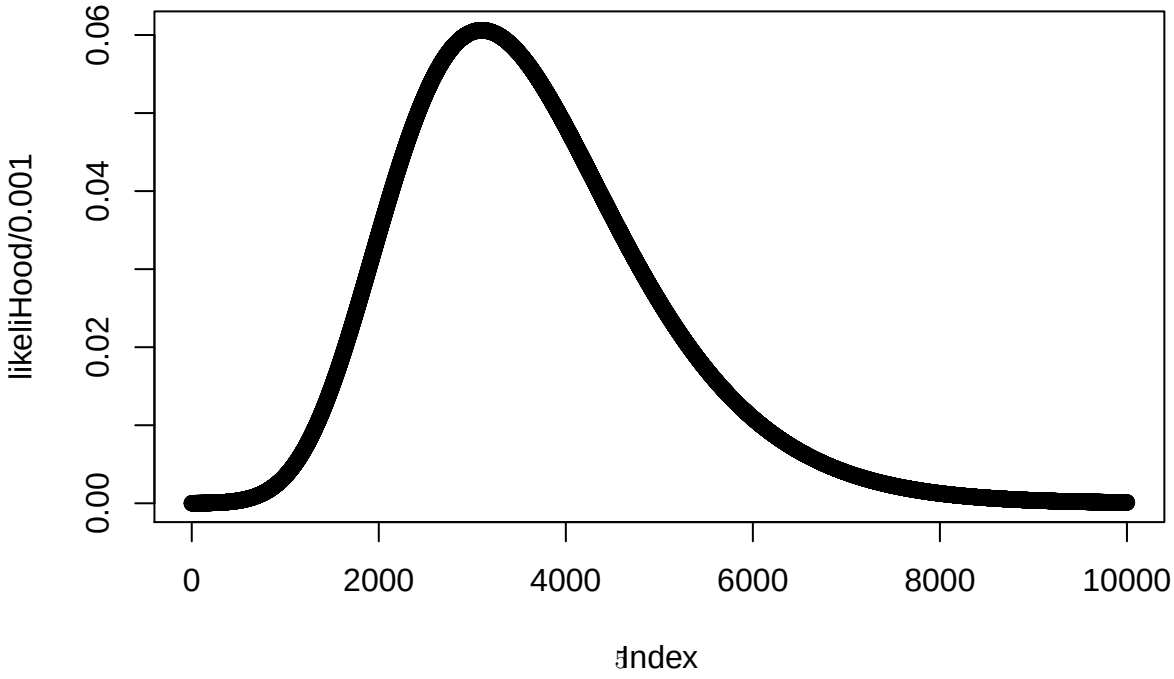
c

```
##
## Call:
##  density.default(x = middleData)
##
## Data: middleData (9501 obs.);    Bandwidth 'bw' = 0.001536
##
##        x                 y
##  Min.   :0.006387   Min.   : 0.00214
##  1st Qu.:0.023694   1st Qu.: 2.42564
##  Median :0.041001   Median : 7.10815
##  Mean   :0.041001   Mean   :14.43085
##  3rd Qu.:0.058308   3rd Qu.:25.77939
##  Max.   :0.075615   Max.   :44.42975
## [1] 0.01099648
## [1] 0.07100567
```

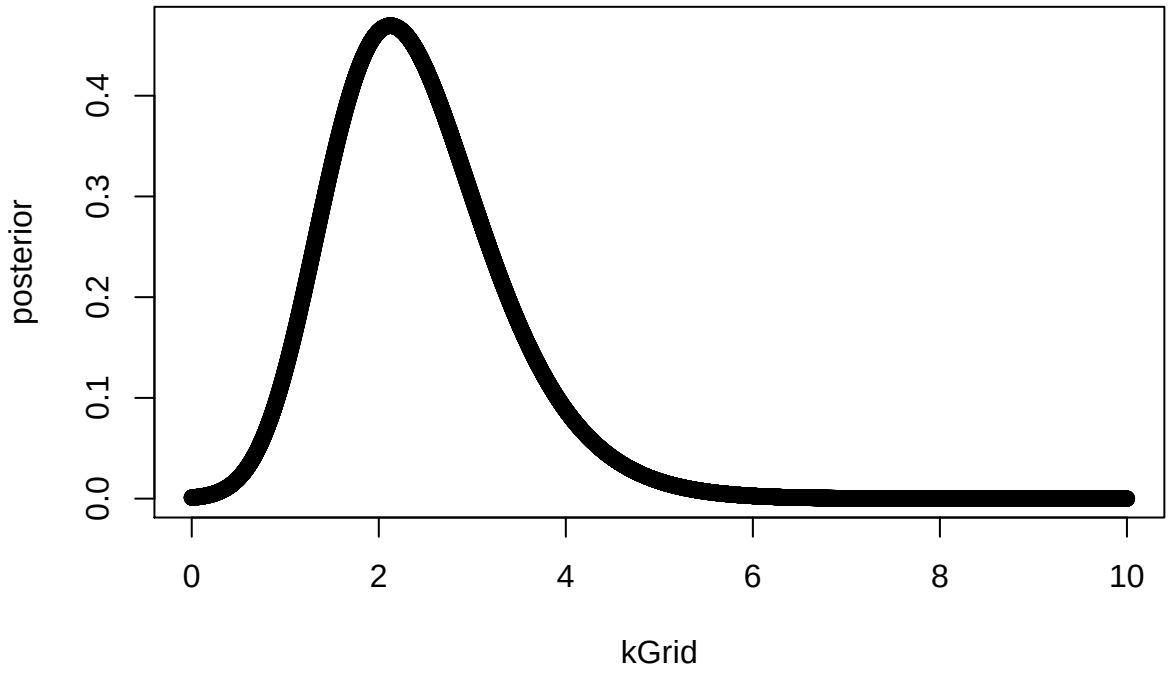
Task 3

a


priorDist
0.0
0.2
0.4
0.6
0.8
1.0
0
2000
4000
6000
8000
10000
Index


likeliHood/0.001
0.00
0.02
0.04
0.06
0
2000
4000
6000
8000
10000
Index

```
## [1] 0.01006976
```




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

b