Lab1

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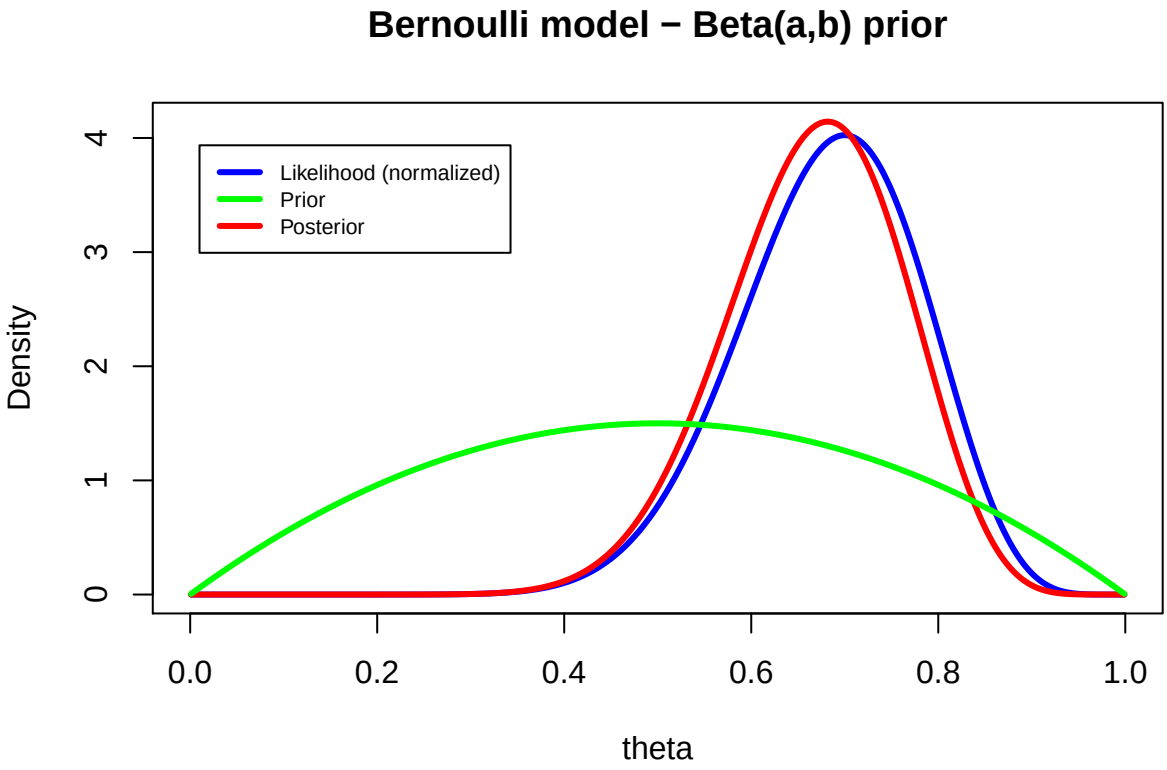
Task 1

a)

For 20 and 10000 draws repectively we get:

```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.108916008104342"
## [1] "Mean: 0.693247041754232"
```




```
## [1] "Posterior Mean GT: 0.666666666666667"
## [1] "ground truth std: 0.0942809041582063"
## [1] "std: 0.0932435668335933"
## [1] "Mean: 0.66722315799665"
```

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

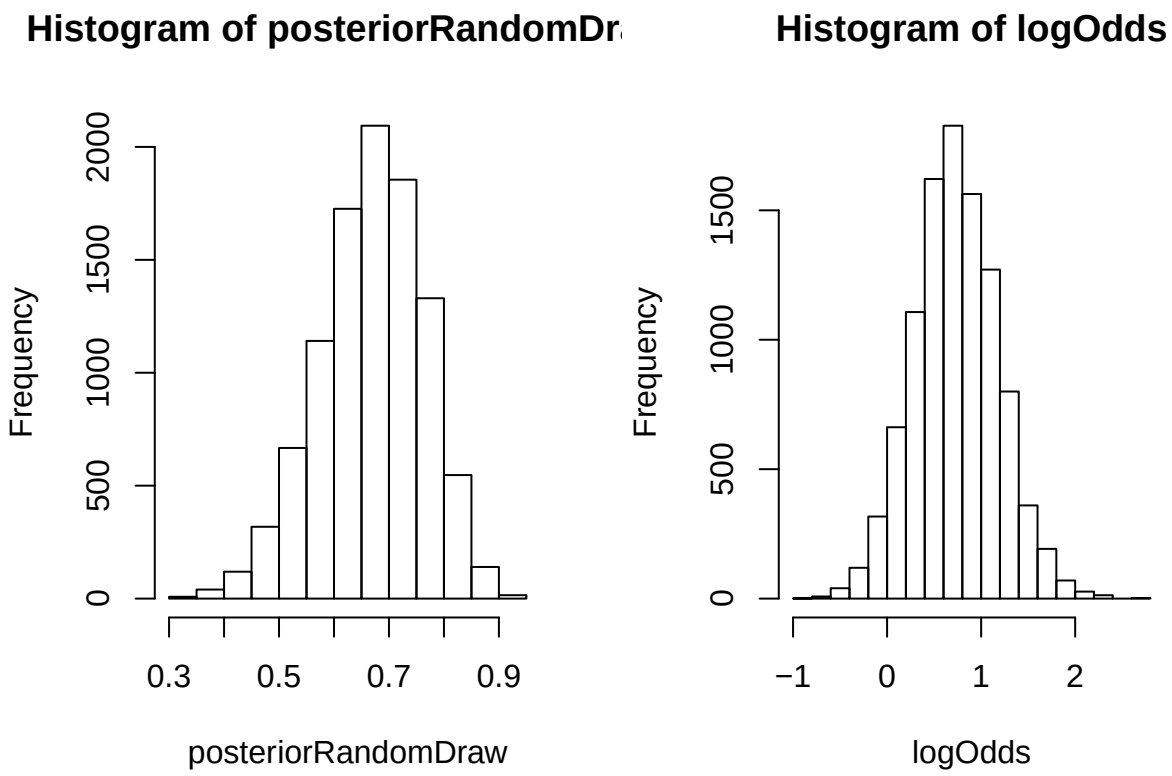
b)

```
## [1] "propability condition with random: 0.0036"
```

```
## [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)



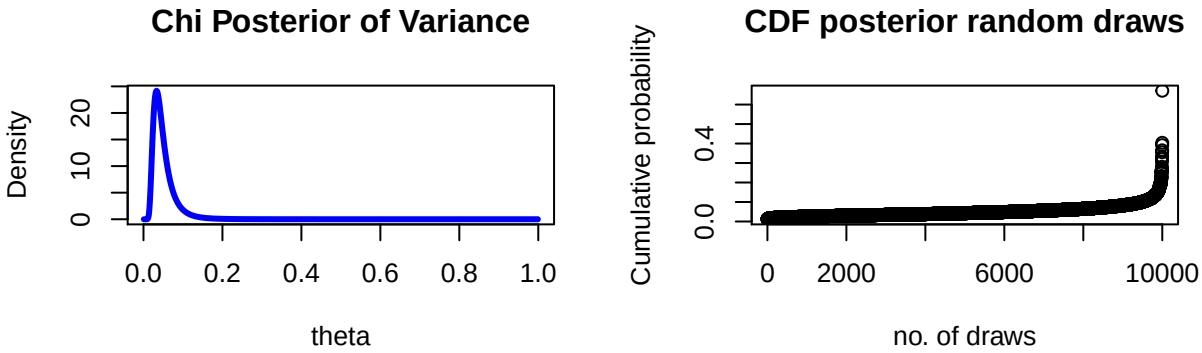

```
##
## Call:
##  density.default(x = logOdds)
##
## Data: logOdds (10000 obs.);  Bandwidth 'bw' = 0.06366
##
##        x                 y
##  Min.   :-1.03007   Min.   :0.0000071
##  1st Qu.:-0.03592   1st Qu.:0.0055394
##  Median : 0.95823   Median :0.0783128
##  Mean   : 0.95823   Mean   :0.2512249
##  3rd Qu.: 1.95239   3rd Qu.:0.4653388
##  Max.   : 2.94654   Max.   :0.9318959
```

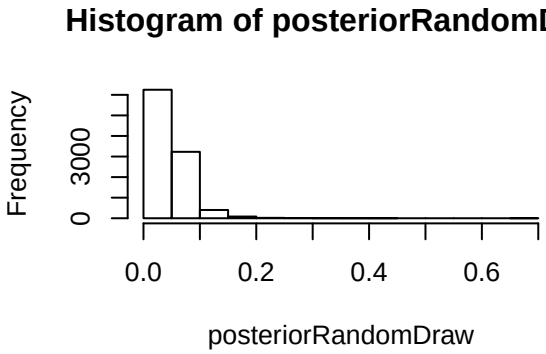
Task 2

a

```
## Warning: package 'LaplacesDemon' was built under R version 3.4.4
```

```
## The following objects are masked from mtcars (pos = 5):
##
##     am, carb, cyl, disp, drat, gear, hp, mpg, qsec, vs, wt
```

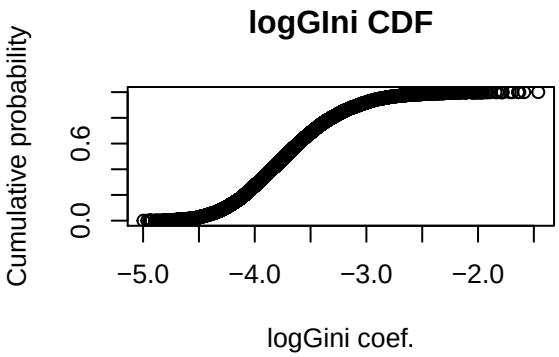


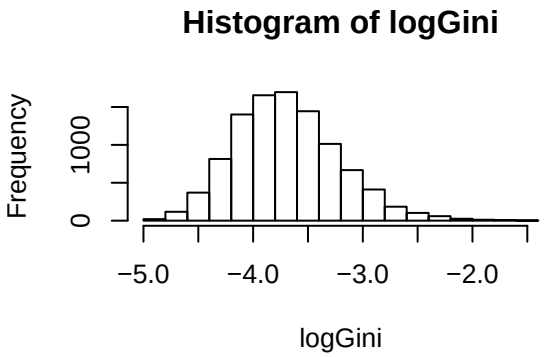


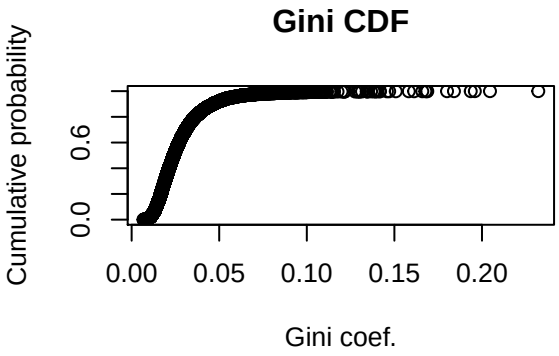
b

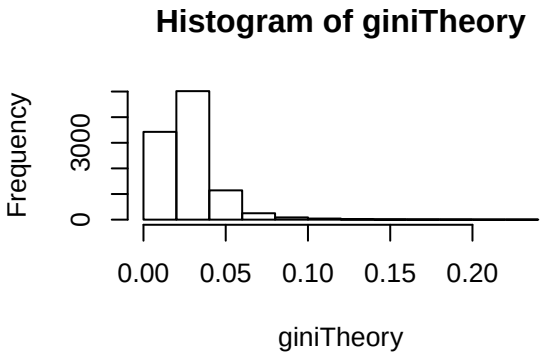
```
## The following objects are masked from mtcars (pos = 3):
##
##     am, carb, cyl, disp, drat, gear, hp, mpg, qsec, vs, wt
```

```
## The following objects are masked from mtcars (pos = 6):
##
##     am, carb, cyl, disp, drat, gear, hp, mpg, qsec, vs, wt
```









c

```
##
## Call:
##  density.default(x = middleData)
##
## Data: middleData (9501 obs.);    Bandwidth 'bw' = 0.001563
##
##        x                  y
##  Min.   :0.006417   Min.   : 0.00192
##  1st Qu.:0.023728   1st Qu.: 2.21714
##  Median :0.041039   Median : 7.78380
##  Mean   :0.041039   Mean   :14.42745
##  3rd Qu.:0.058350   3rd Qu.:25.56459
##  Max.   :0.075661   Max.   :43.48395
## [1] 0.01110461
## [1] 0.070973
```

Task 3

a

b