

# BDA - Assignment 1

Anonymous

## Contents

Exercise 1	1
Exercise 2	1
Exercise 4	4
Exercise 5	4

## Exercise 1

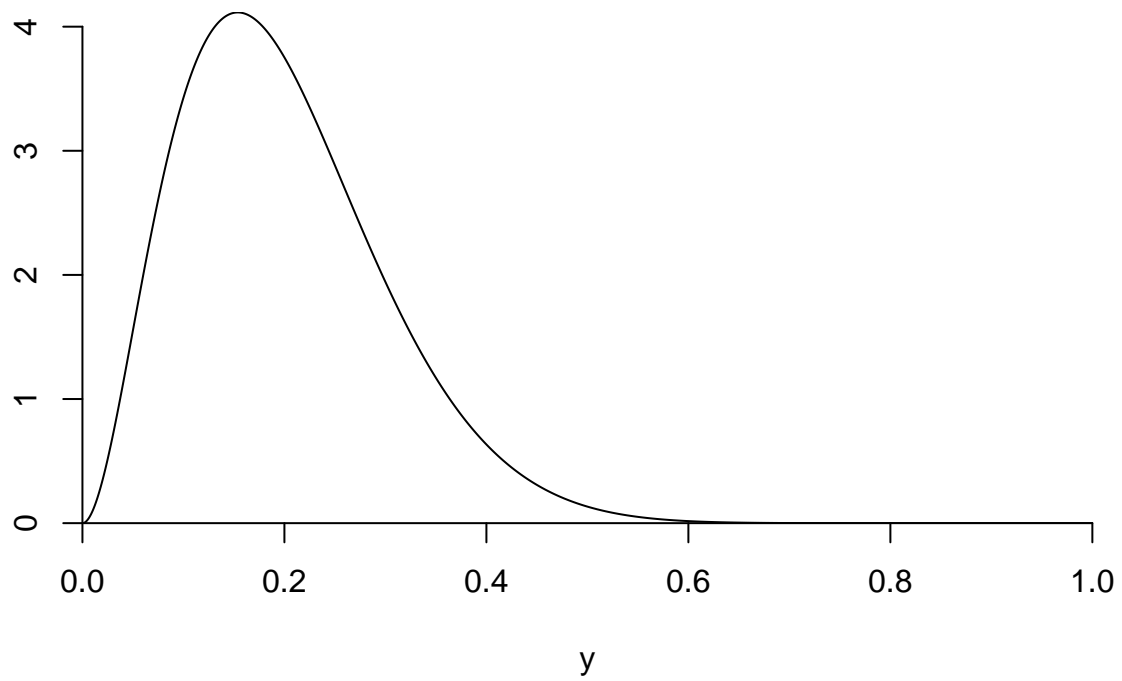
## Exercise 2

a)

```
x <- seq(0, 1, length.out = 10000)
m = .2
sigmasq = .01

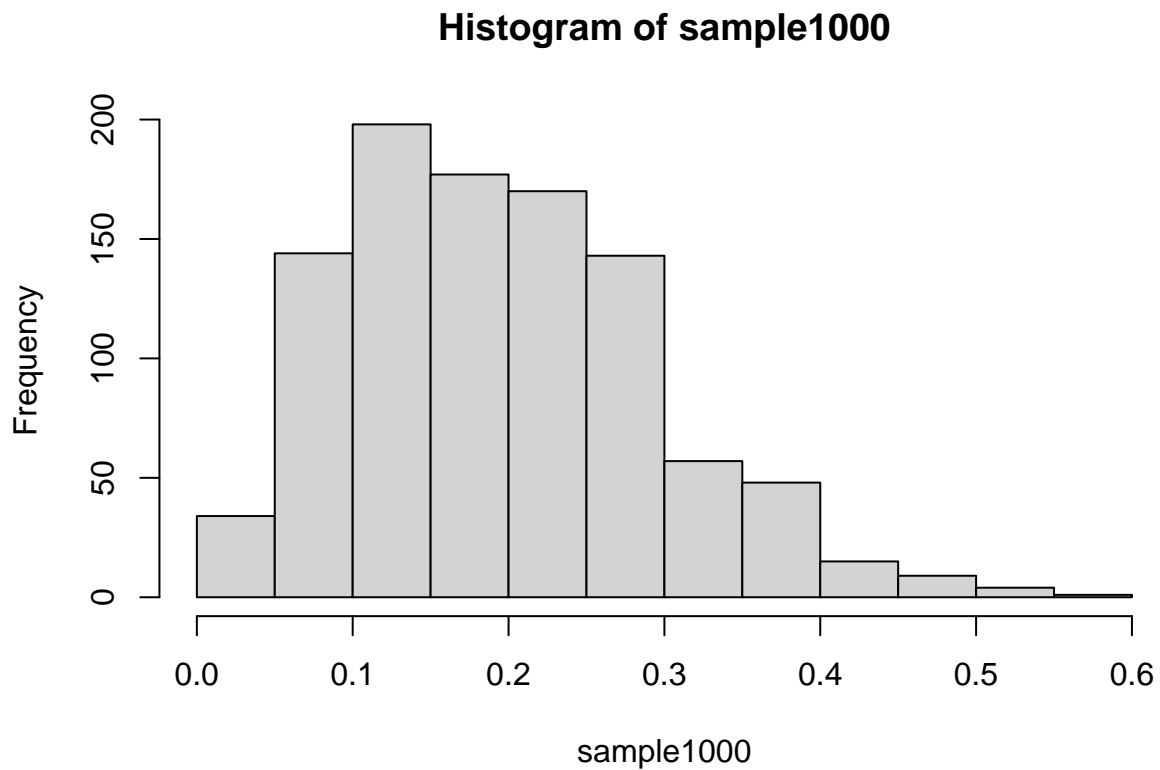
alpha = m * (m * (1 - m) / sigmasq - 1)
beta = alpha * (1 - m) / m

plot(x, dbeta(x, alpha, beta), type="l", xlab="y", ylab="", xaxs="i",
      yaxs="i", bty="n", cex=2)
```



b)

```
sample1000 = rbeta(1000, alpha, beta, ncp=0)
hist(sample1000)
```



c)

```
mean(sample1000)
```

```
## [1] 0.1948673
```

```
var(sample1000)
```

```
## [1] 0.009668483
```

d)

```
left_bound = mean(sample1000) - quantile(sample1000, probs = 0.95)
right_bound = mean(sample1000) + quantile(sample1000, probs = 0.95)

print(sprintf('The interval is [%f; %f]', left_bound, right_bound))
```

```
## [1] "The interval is [-0.178840; 0.568574]"
```

## Exercise 4

a) What is the probability of picking a red ball?

```
boxes <-  
  matrix(  
    c(2, 5, 4, 1, 1, 3),  
    ncol = 2,  
    byrow = TRUE,  
    dimnames = list(c("A", "B", "C"), c("red", "white"))  
  )  
p_red <- function(boxes) {  
  probA = 0.4  
  probB = 0.1  
  probC = 0.5  
  prob = boxes[1, 1] / (boxes[1, 1] + boxes[1, 2]) * probA + boxes[2, 1] /  
    (boxes[2, 1] + boxes[2, 2]) * probB + boxes[3, 1] / (boxes[3, 1] + boxes[3, 2]) *  
    probC  
  return(prob)  
}  
p_red(boxes = boxes)
```

```
## [1] 0.3192857
```

b) If a red ball was picked, from which box it most probably came from?

```
p_box <- function(boxes) {  
  probA = 0.4  
  probB = 0.1  
  probC = 0.5  
  
  boxA = (boxes[1, 1] / (boxes[1, 1] + boxes[1, 2])) * probA / p_red(boxes = boxes)  
  boxB = (boxes[2, 1] / (boxes[2, 1] + boxes[2, 2])) * probB / p_red(boxes = boxes)  
  boxC = (boxes[3, 1] / (boxes[3, 1] + boxes[3, 2])) * probC / p_red(boxes = boxes)  
  
  return (c(boxA, boxB, boxC))  
}  
p_box(boxes = boxes)
```

```
## [1] 0.3579418 0.2505593 0.3914989
```

## Exercise 5

What is the probability that Elvis was an identical twin?

```
p_identical_twin <- function(fraternal_prob, identical_prob) {  
  boy = .5  
  girl = .5  
  
  identical_twin = boy * identical_prob / (boy * identical_prob + boy * boy *  
                                           fraternal_prob)  
  return(identical_twin)  
}  
  
p_identical_twin(1/150,1/400)
```

```
## [1] 0.4285714
```