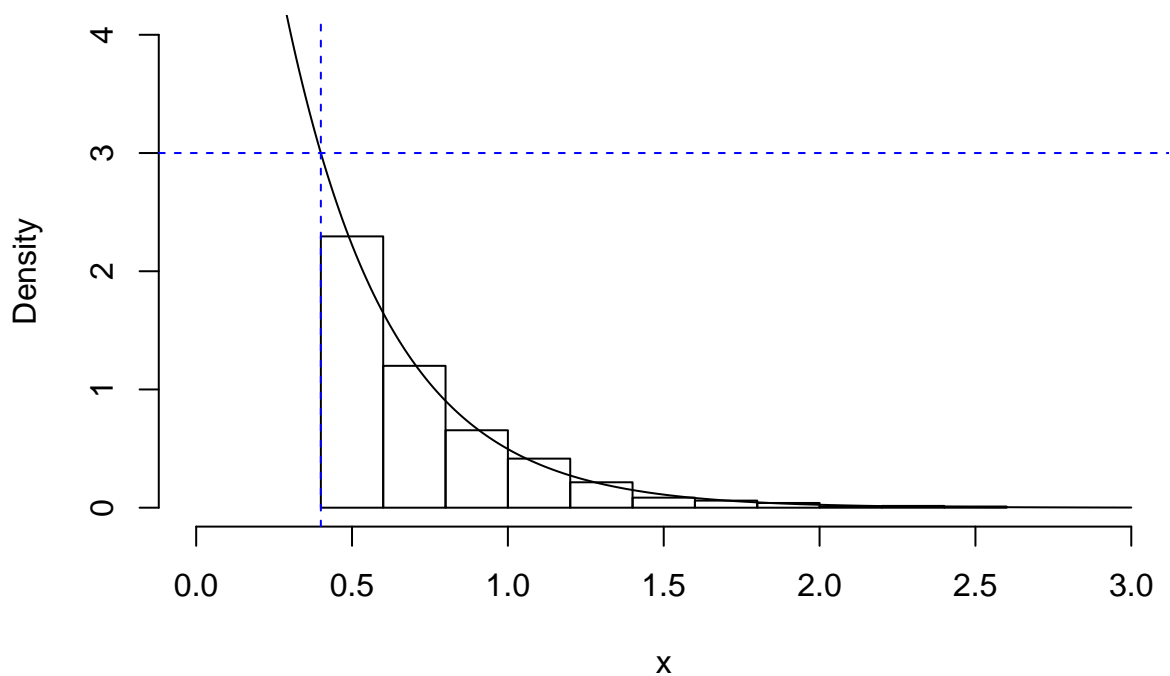# HW 1 Ian Douglas

Homework 1

Question 3.1, pg. 91

```r
eta <- .4
theta <- 3
n <- 1000
u <- runif(n)
x <- (-log(u)/theta) + eta
y <- seq(0,3,.01)
hist(x, prob = TRUE,

     xlim = c(0,3), ylim = c(0, 4))
lines(y, theta*exp(-theta*(y-eta)))
abline(v = eta, col = "blue", lty = 2)
abline(h = theta, col = "blue", lty = 2)
```

Histogram of x

Additional question 2

```r
set.seed(37)
n <- 10000
nu <- 5
X <- matrix(rnorm(n*nu), n, nu)^2
y <- rowSums(X)
```
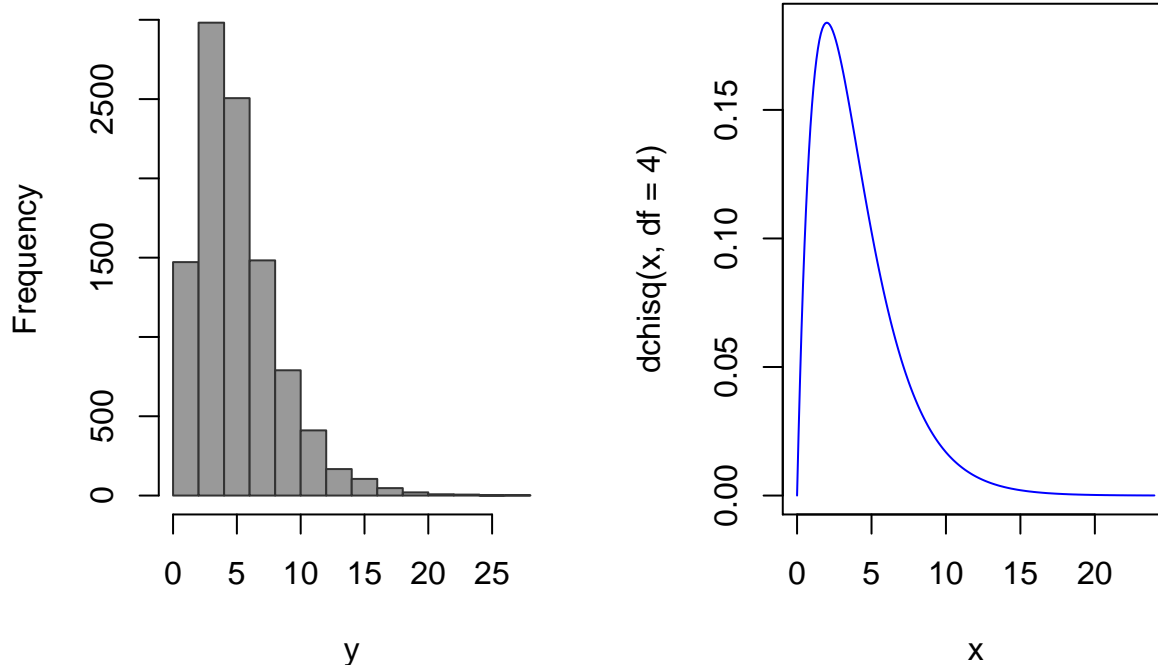
```r
#estimate of the mean:
mean(y)*2
```

[1] 10.05521

```r
#estimate of the variance:
2*mean(y)
```

[1] 10.05521

```r
#plot with appropriate Chi-Sq: df = n-1 = 4
par(mfrow=c(1,2))
x <- seq(0, 24, by = 0.1)
hist(y, col = rgb(.6,.6,.6, alpha = 1),border = rgb(.2,.2,.2, alpha = 1))
plot(x, y = dchisq(x,df = 4), type = "l",col = "blue")
```


Histogram of y

```r
#bias of the mean and variance estimates:
mean(y) - 5
```

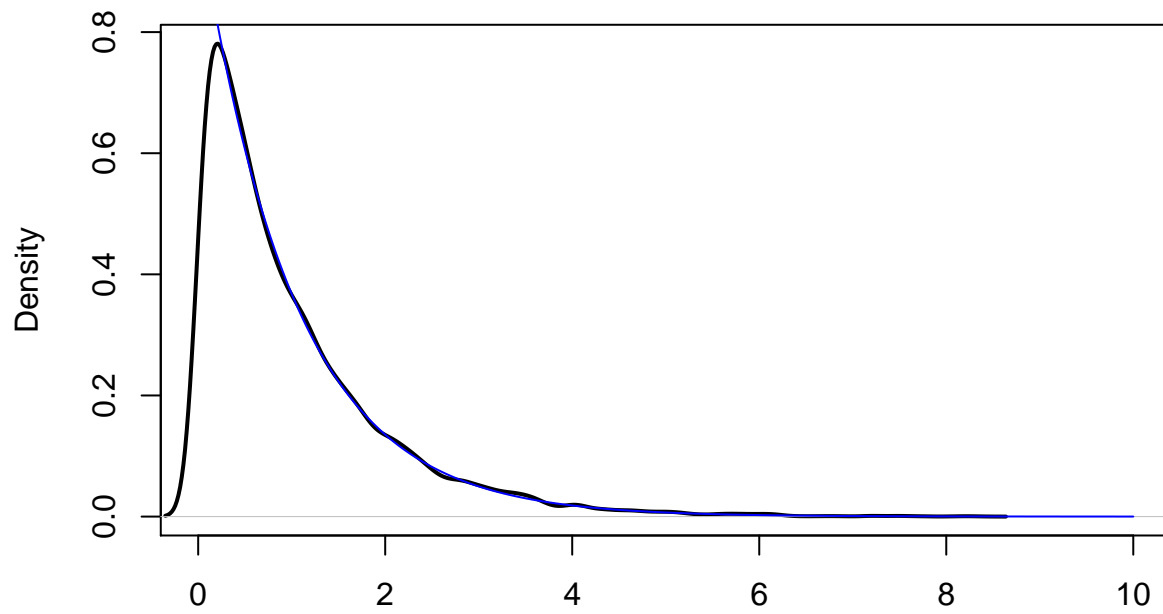## [1] 0.02760273

```r
2*mean(y) - 10
```

[1] 0.05520547

Additional question 3

```r
plot(density(rexp(10000,1)), xlim = c(0,10), lwd =2, main = expression(f(x)==lambda*e^(-lambda*x)))
lines(x=seq(0,10,by=.01),dexp(seq(0,10,by=.01)),col = 'blue', lwd = 1)
```

$$f(x) = \lambda e^{(-\lambda x)}$$

N = 10000   Bandwidth = 0.1172

Additional question 4

```r
Y <- cbind(rnorm(n=10000),rnorm(n=10000))
Y2 <- Y*Y
Y3 <- rowSums(Y2)
mean(sqrt(Y3))
```

```
## [1] 1.248538
```

```r
#estimate is approximately 1.25
```