output:
pdf_document: default
html_document: default

Emprical Methods HW1

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Part1

```
library(spatstat)
```

```
## Loading required package: spatstat.data
```

```
## Loading required package: nlme
```

```
## Loading required package: rpart
```

```
##
## spatstat 1.64-1       (nickname: 'Help you I can, yes!')
## For an introduction to spatstat, type 'beginner'
```

```
##
## Note: spatstat version 1.64-1 is out of date by more than 9 months; we recommend upgrading to the la
```

```
setwd("~/Desktop/BC/Spring 2021/Emprical Methods/HW1/")
data <- read.csv('bids1.csv')
n <- length(data$bids)
m <- mean(data$bids)
sd <- sd(data$bids)

lower_bound <- min(data$bids)
upper_bound <- max(data$bids)
x <- seq(lower_bound, upper_bound, length.out = 300)
y <- dnorm(x, mean =m, sd = sd)

IQ <- IQR(data$bids)
```

Since $\min(0.7419479\ ,\ \text{IQ}/1.34) = \min\ (0.7419479\ ,\ 0.8543843) = 0.7419479$

```
h <- 0.9 * sd * (n)^(-1/5)
h
```

```
## [1] 0.2133987
```

```
# bw.nrd0(data$bids) gives h
d_gauss <- density(data$bids, bw=h , kernel="gaussian")
d_epanec <- density(data$bids, bw=h , kernel="epanechnikov")
```

Part2

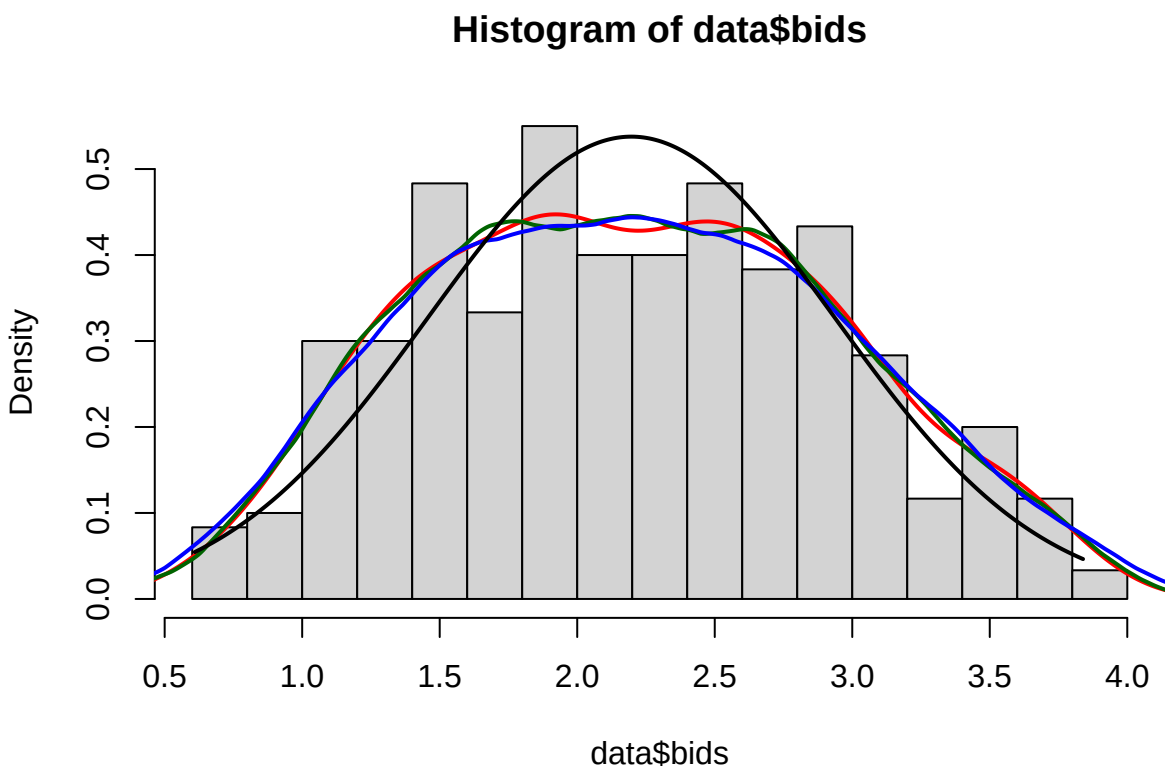
```
h_cv <- bw.ucv(data$bids)
```

```
## Warning in bw.ucv(data$bids): minimum occurred at one end of the range
```

```
d_epanec2 <- density(data$bids, bw=h_cv , kernel="epanechnikov")
```

Part3

```
hist(data$bids,20,prob=TRUE)
lines(density(data$bids, bw=h , kernel="gaussian"), col="red" ,lwd=2)
lines(density(data$bids, bw=h , kernel="epanechnikov"), col="darkgreen", lwd=2)
lines(density(data$bids, bw=h_cv , kernel="epanechnikov"), col="blue", lwd=2)
lines(x, y, lwd=2)
```



Gaussian kernel fits best.

Part4

```
g <- approxfun(d_epanec2$x, d_epanec2$y)
g(upper_bound)
```

```
## [1] 0.07451343
```

```
G <- CDF(d_epanec2)
G(upper_bound)
```

```
## [1] 0.9847284
```

```
v<- c()
for(i in 1:n){
  v[i] <- data$bids[i] + G(data$bids[i])/(2*g(data$bids[i]))

}
```

Part5

```
h_pi <- bw.nrd0(v)
d_v_epanec <- density(data$bids, bw=h_pi , kernel="epanechnikov")
```

Part6

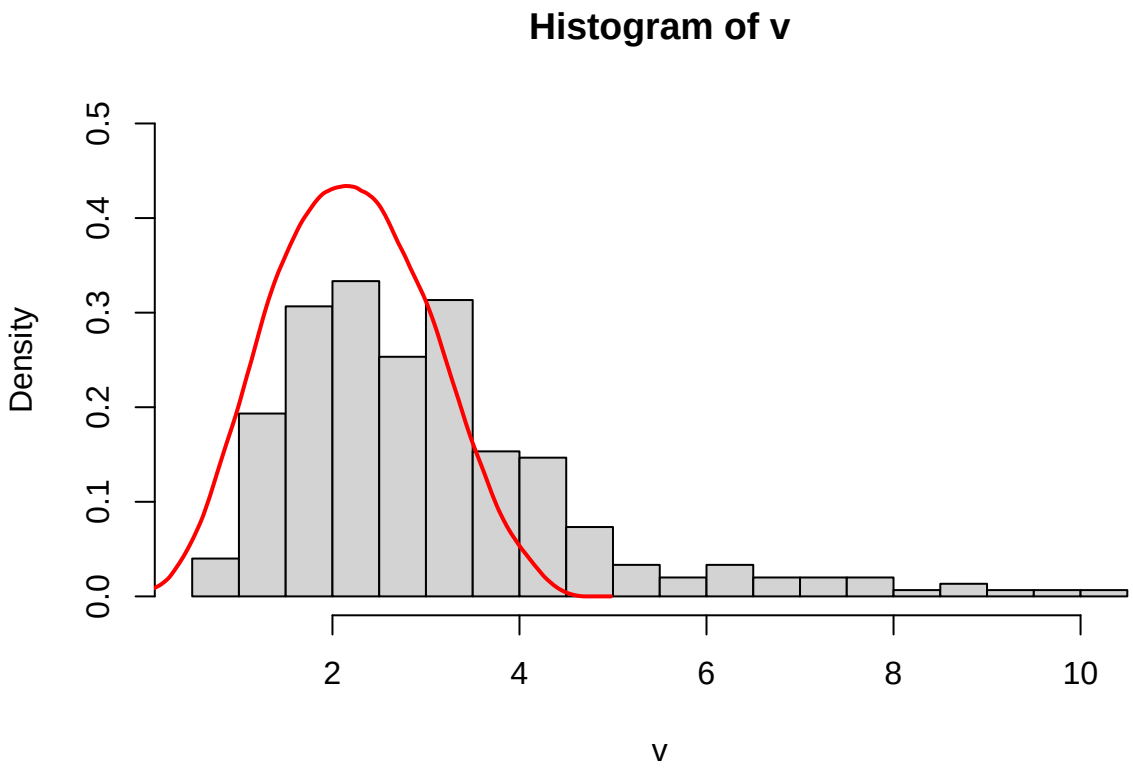
```r
mean(v)
```

```
## [1] 3.065484
```

```r
sd(v)
```

```
## [1] 1.634193
```

```r
hist(v,20,prob=TRUE, ylim=c(0,0.5))
lines(density(data$bids, bw=h_pi , kernel="epanechnikov"), col="red" ,lwd=2)
```



I guess the valuations were generated with log normal distribution.