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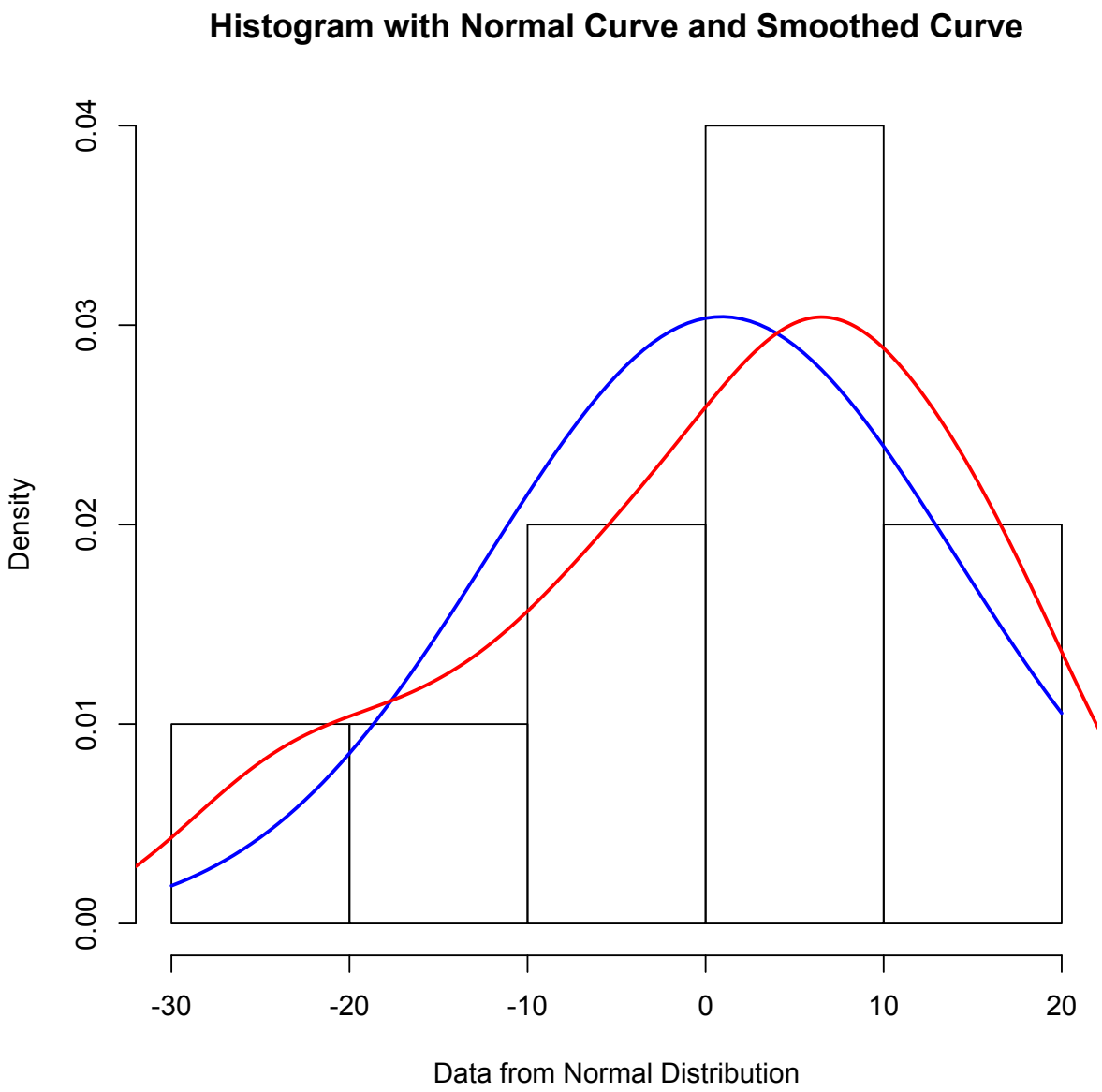
Instructor: Womble

A. 1.

```
RandomData <- rnorm(10,mean=5,sd=12)
mean(RandomData)
sd(RandomData)

std<-sd(RandomData)
m <- mean(RandomData)
quartz()    # pop up a window

hist(RandomData, xlab="Data from Normal Distribution", freq = FALSE,
    main="Histogram with Normal Curve and Smoothed Curve")
curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)  # normal
lines(density(RandomData, adjust=1),col = "red", lwd=2)     # pdf
```

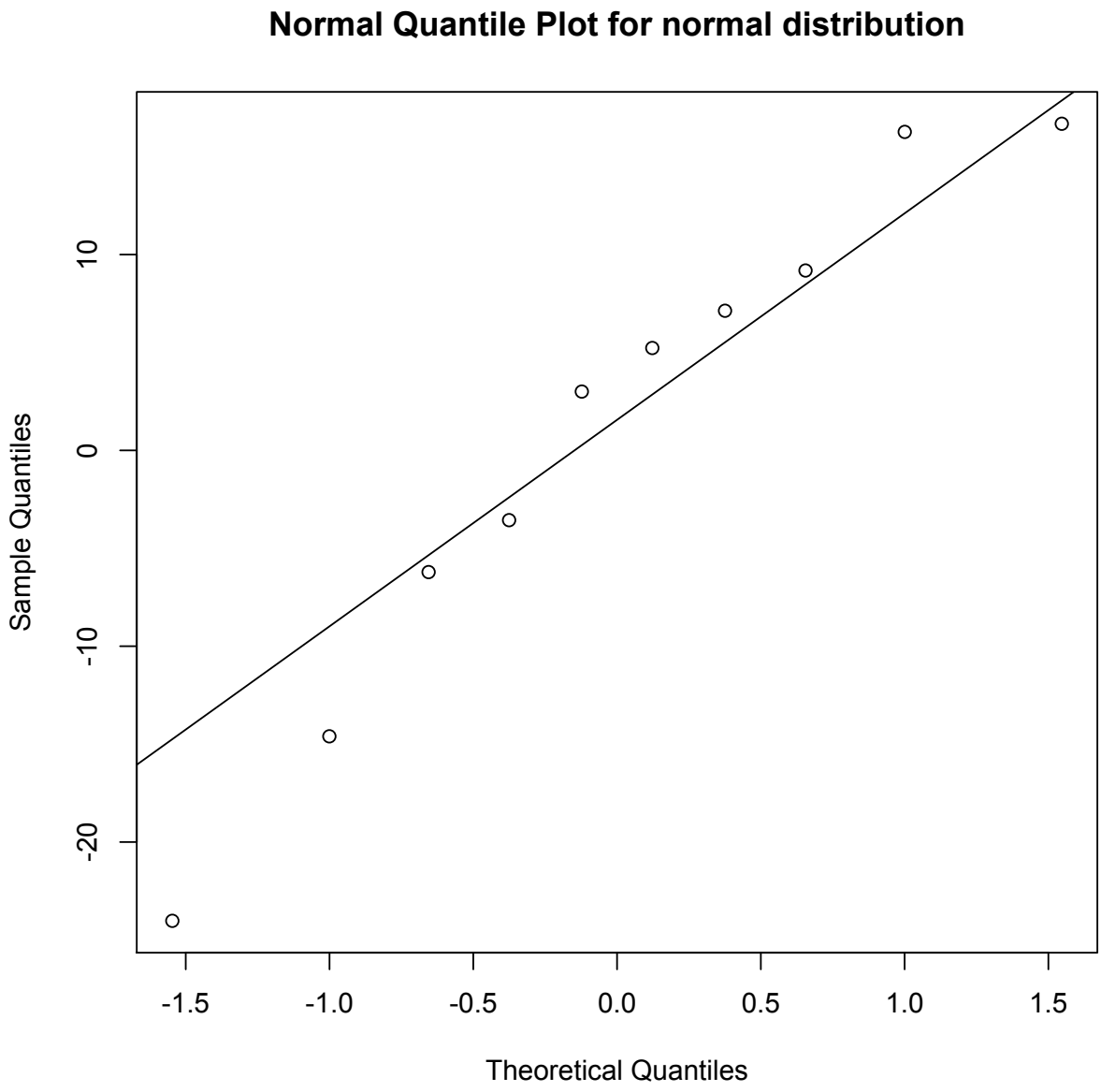
2.

It is difficult to say the histogram is normal or not. Because the points are so few that different people might get different shapes of the histogram.



3.

This suggest important deviations from normality. Because they are not looking like a straight line.

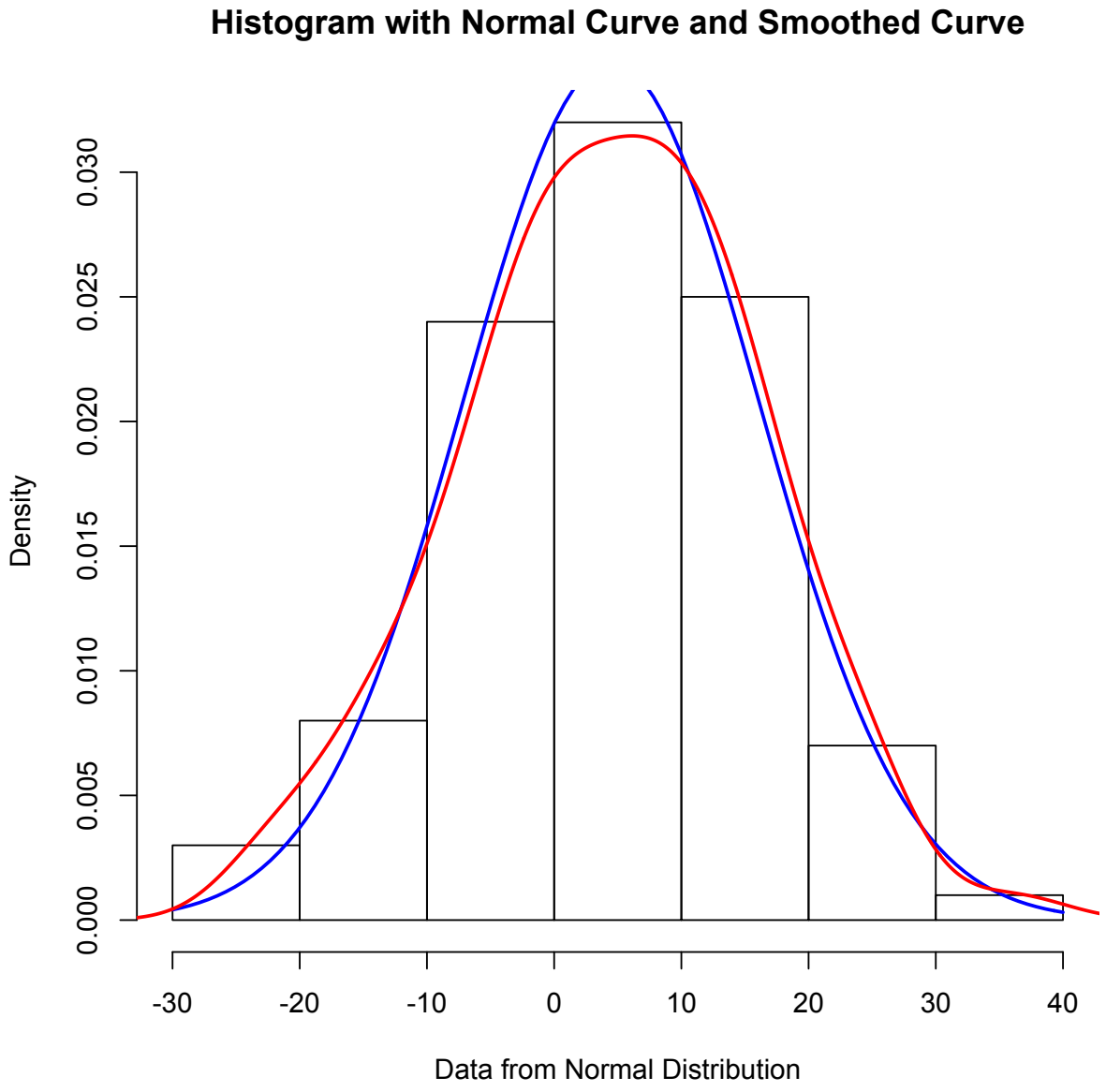


B 1.

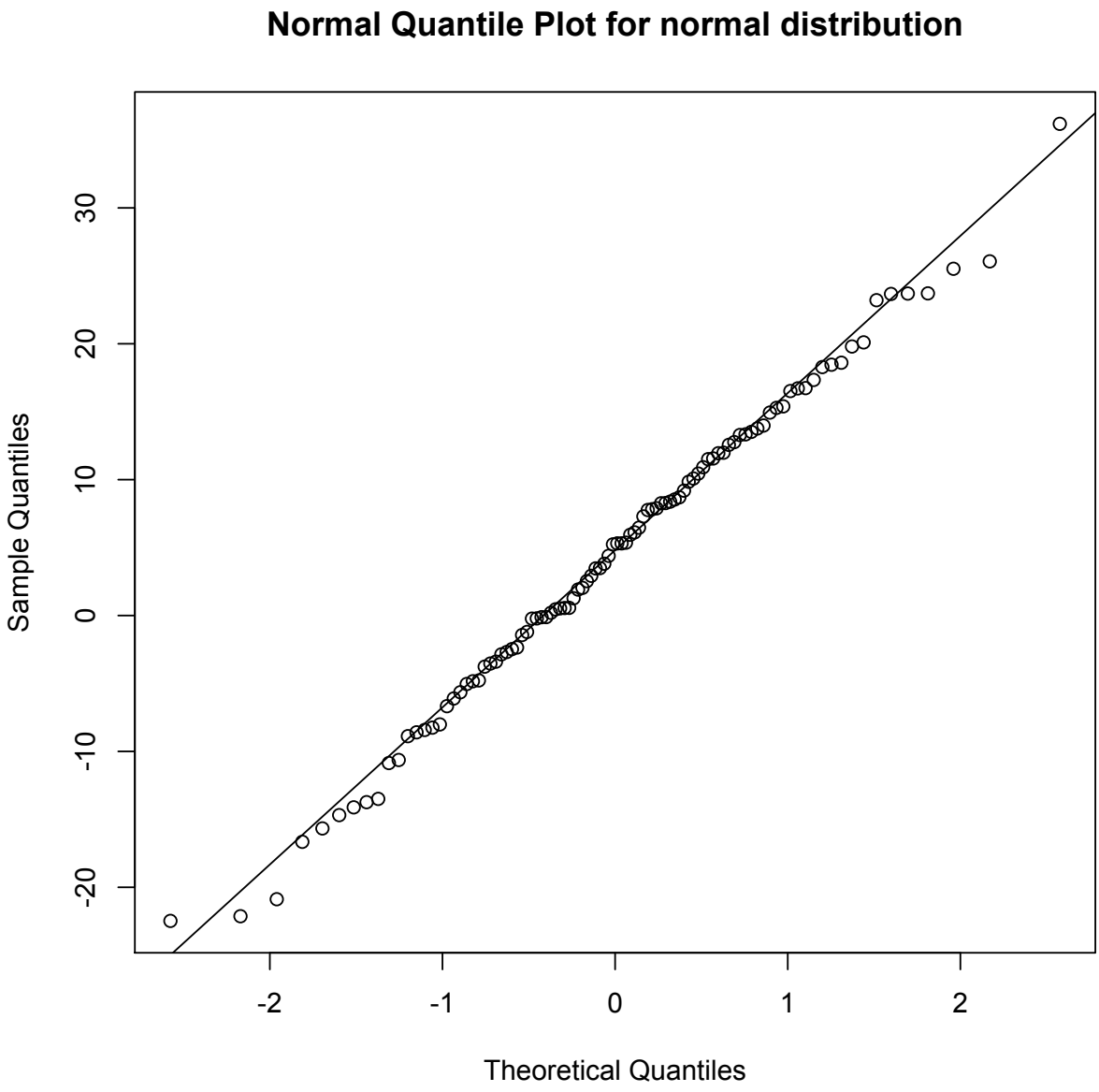
```
RandomData <- rnorm(100,mean=5,sd=12)
mean(RandomData)
sd(RandomData)

std<-sd(RandomData)
m <- mean(RandomData)
```

```
quartz()    # pop up a window

hist(RandomData, xlab="Data from Normal Distribution", freq = FALSE,
    main="Histogram with Normal Curve and Smoothed Curve")
curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)  # normal
lines(density(RandomData, adjust=1),col = "red", lwd=2)     # pdf
```

2. The shape of the histogram is fitting the normal distribution.



3. There are only few points outside the line. So QQ-plot doesn't indicate important deviations from normality.

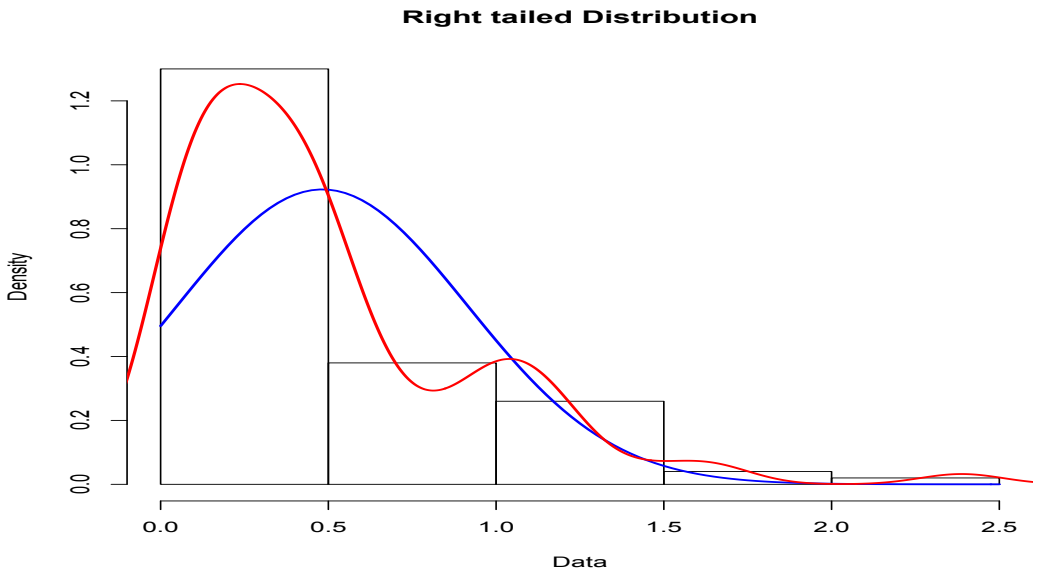


4. The plots in A and B are different. Because the plot B is far more random points than plot A which means B is simulating normality better. For plot A, it even does not look like a normal distribution, although A and B come from the same method.

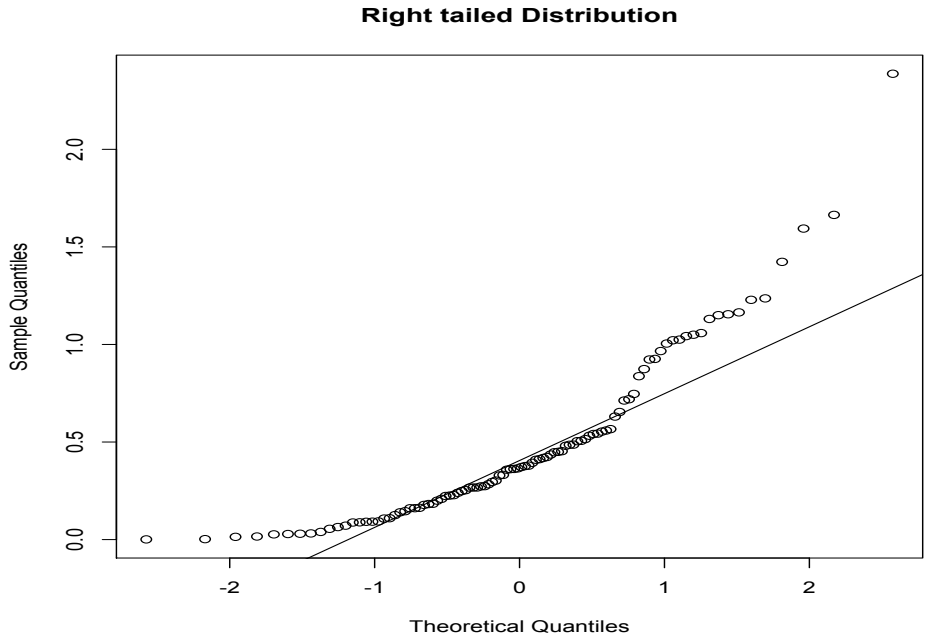
C

1. Right

```
n = 100
right <- rexp(n,rate=2)
left <- rbeta(n,2,0.5,ncp=2)
short <- runif(n,min=0,max=2)
long <- rcauchy(n,location=0,scale=1)
RandomData <- right
title <- "Right tailed Distribution"
quartz()
std<-sd(RandomData)
m <- mean(RandomData)
hist(RandomData, xlab="Data", freq = FALSE, main=title)
curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)
lines(density(RandomData, adjust=1),col = "red", lwd=2)     # pdf
quartz()
qqnorm(RandomData,main=title)
qqline(RandomData)
```



The shape of the histogram is right skewed. The histogram deviates from the normal.

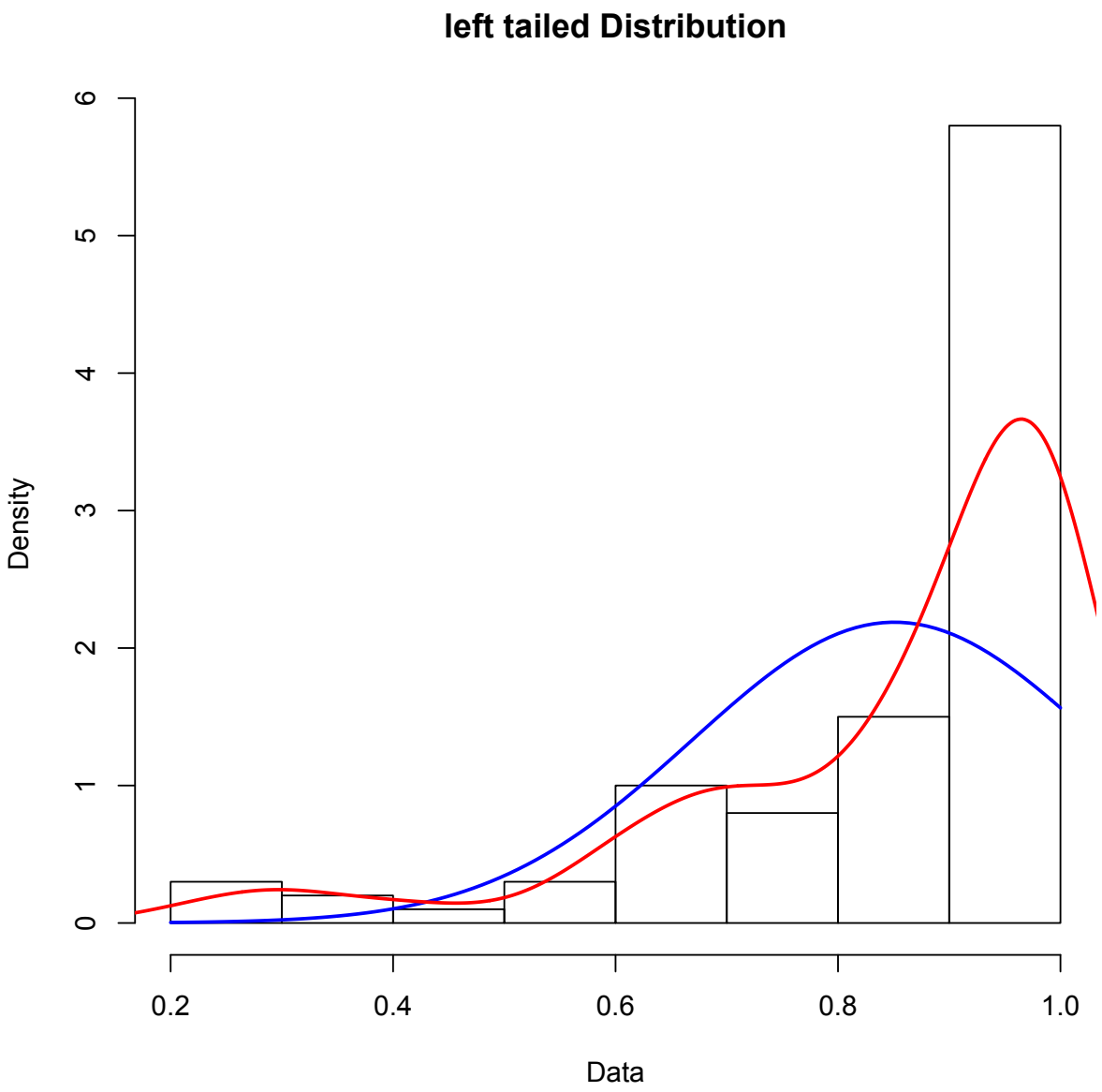


The plot is concave. The QQ-plot suggests important deviations from normality.

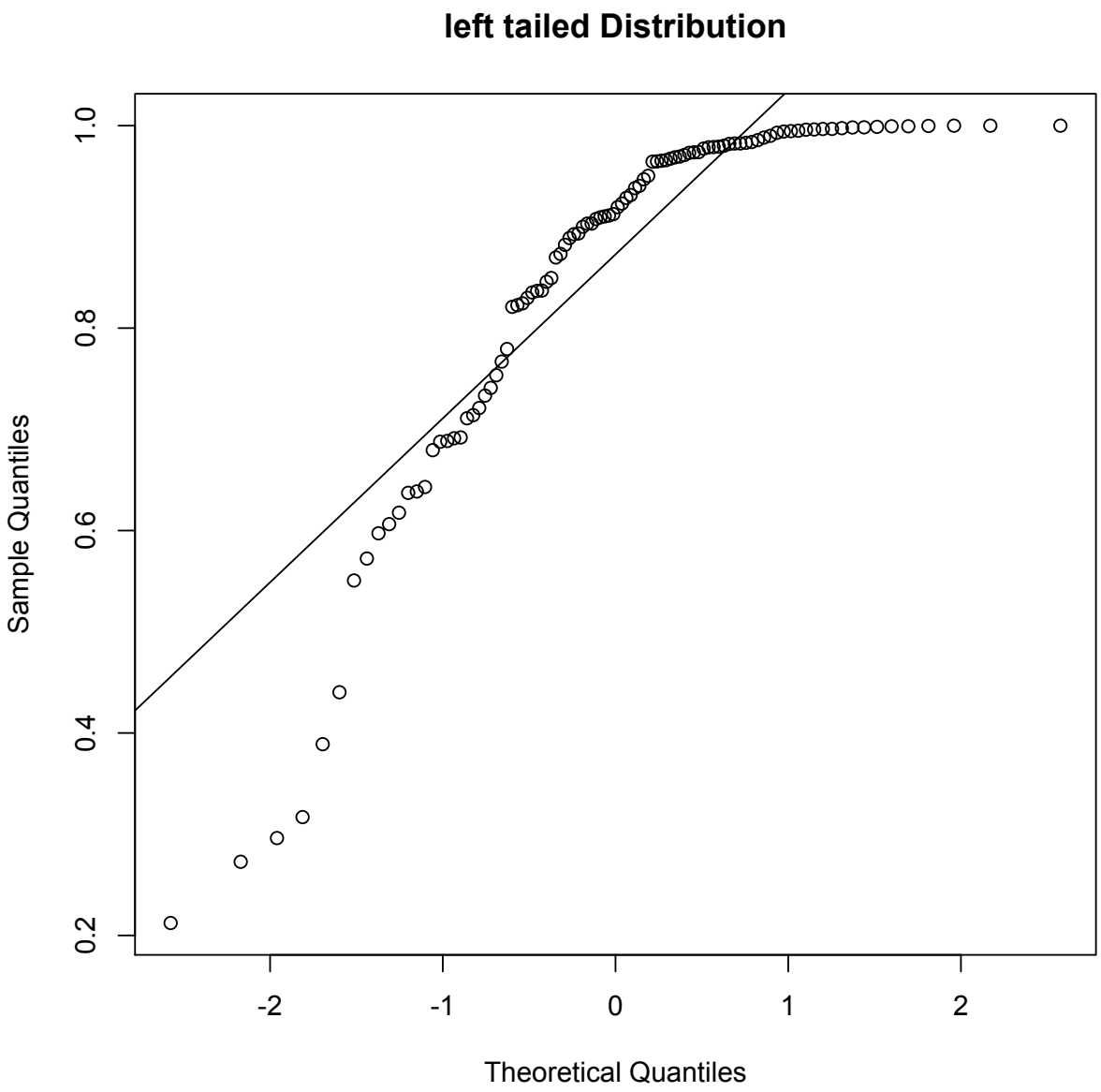
2left

```
n = 100
right <- rexp(n,rate=2)
left <- rbeta(n,2,0.5,ncp=2)
short <- runif(n,min=0,max=2)
long <- rcauchy(n,location=0,scale=1)
RandomData <- left
title <- "left tailed Distribution"
quartz()
std<-sd(RandomData)
m <- mean(RandomData)
hist(RandomData, xlab="Data", freq = FALSE, main=title)
curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)
lines(density(RandomData, adjust=1),col = "red", lwd=2)     # pdf
quartz()
qqnorm(RandomData,main=title)
qqline(RandomData)
```

The shape of the histogram is left skewed. The histogram deviates from the normal.



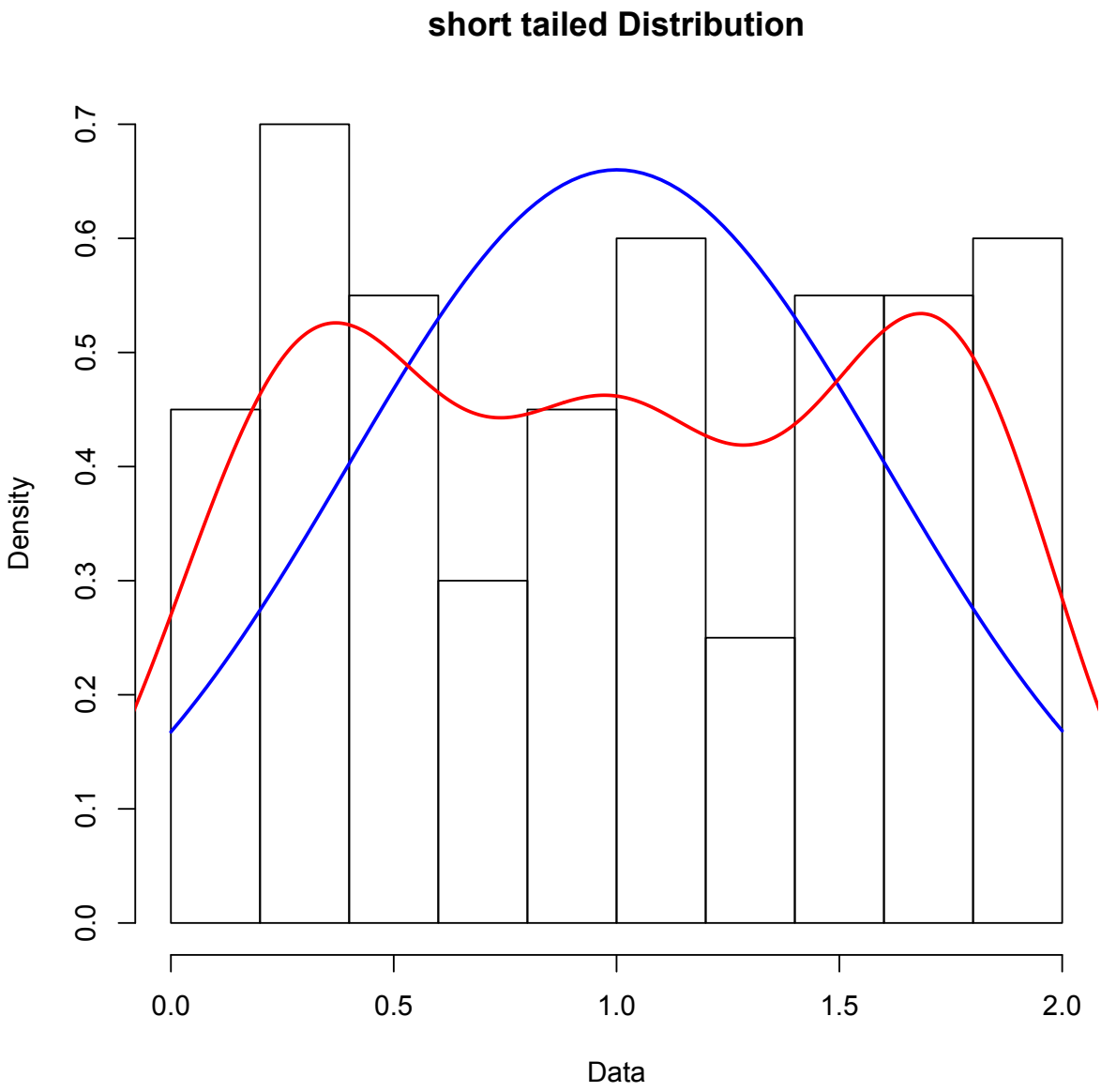
The curve is open convex. The QQ-plot suggests important deviations from normality.



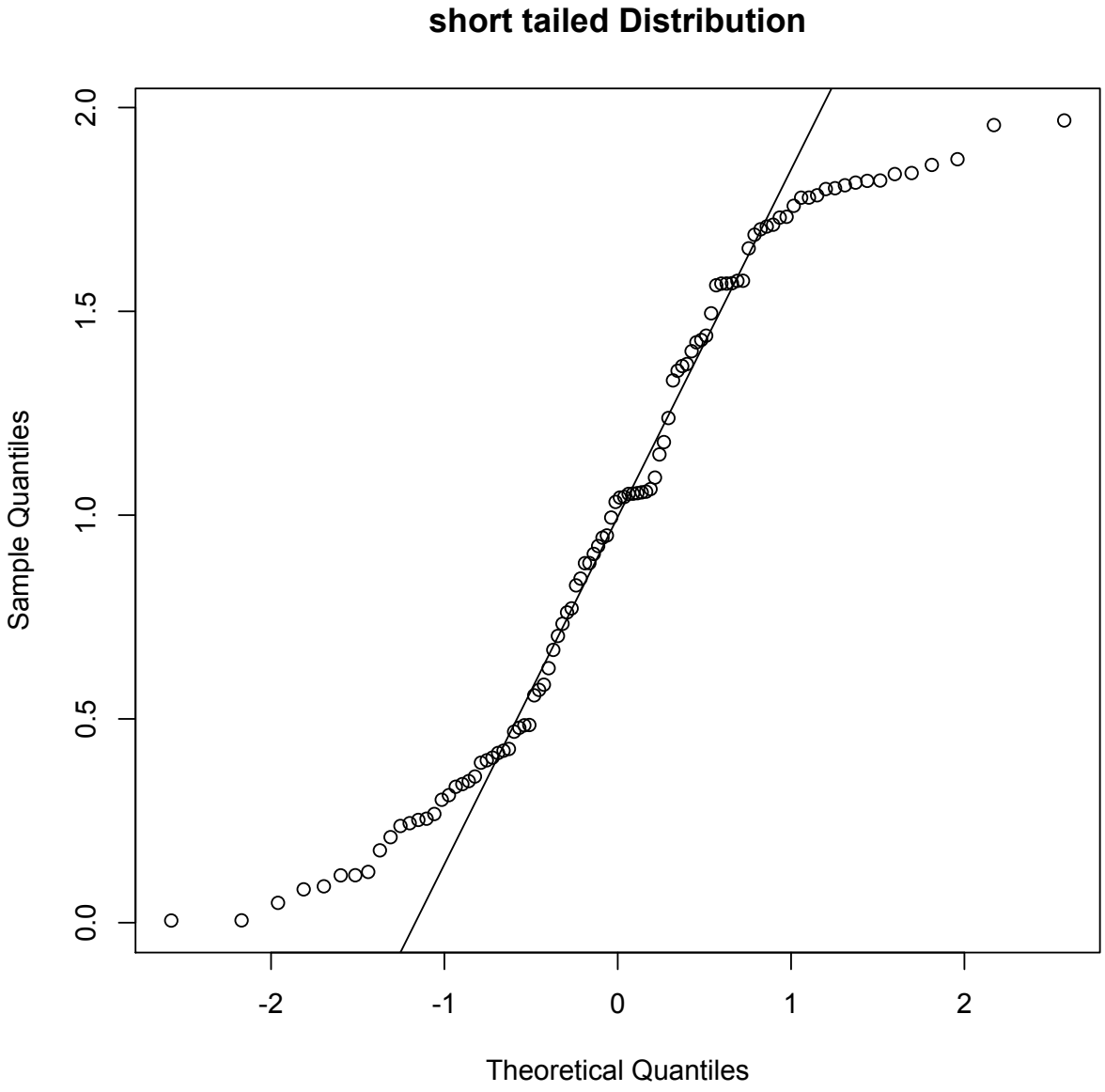
3 short
n = 100
right <- rexp(n,rate=2)
left <- rbeta(n,2,0.5,ncp=2)
short <- runif(n,min=0,max=2)
long <- rcauchy(n,location=0,scale=1)
RandomData <- short
title <- "short tailed Distribution"
quartz()
std<-sd(RandomData)
m <- mean(RandomData)

```
hist(RandomData, xlab="Data", freq = FALSE, main=title)
curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)
lines(density(RandomData, adjust=1),col = "red", lwd=2)     # pdf
quartz()
qqnorm(RandomData,main=title)
qqline(RandomData)
```

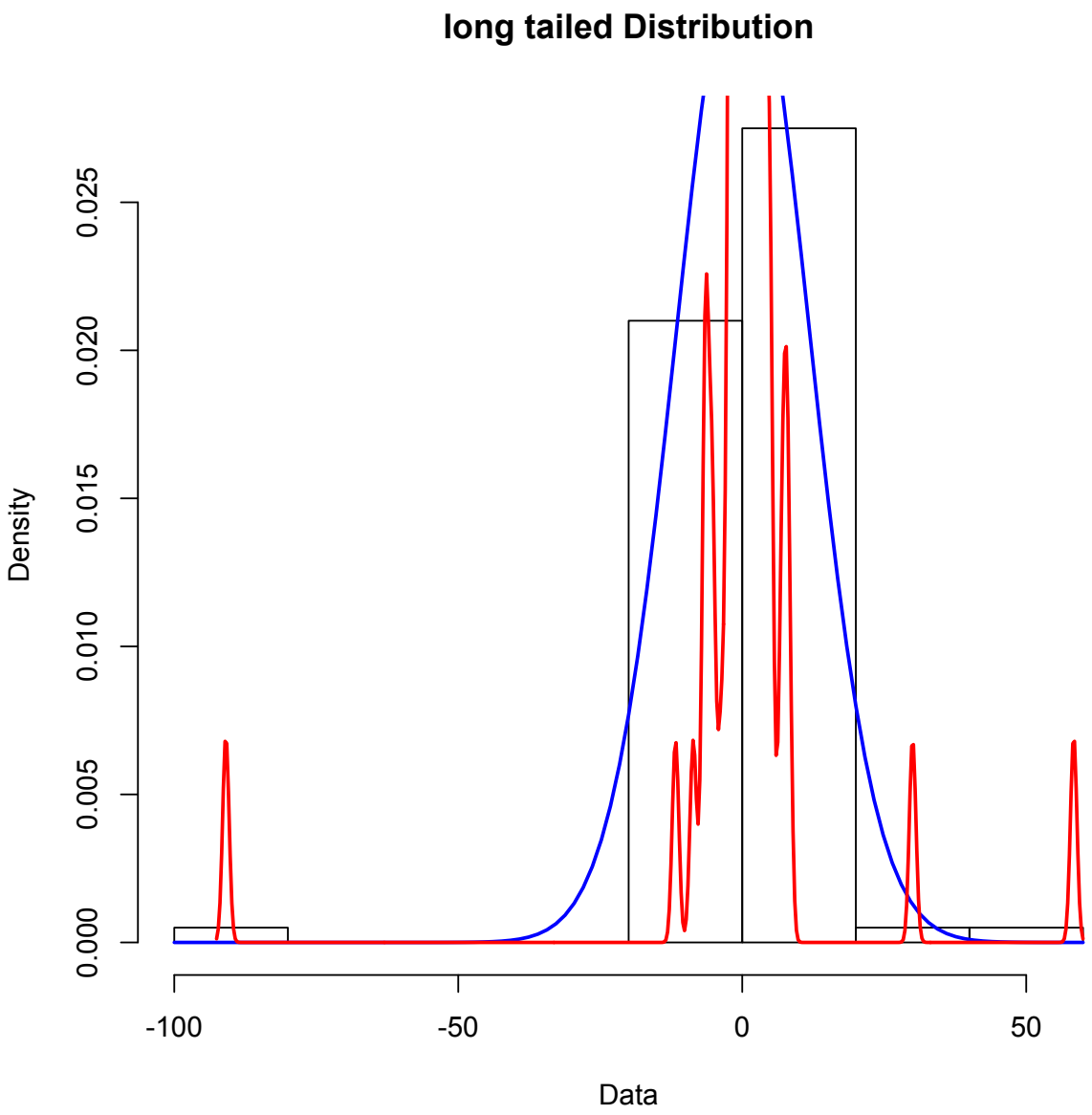
The histogram fails to produce the tails of the normal density curve. It deviates from normal curve.



The points generally have high slope near the center but low slope near the end. The QQ-plot suggests important deviations from normality.

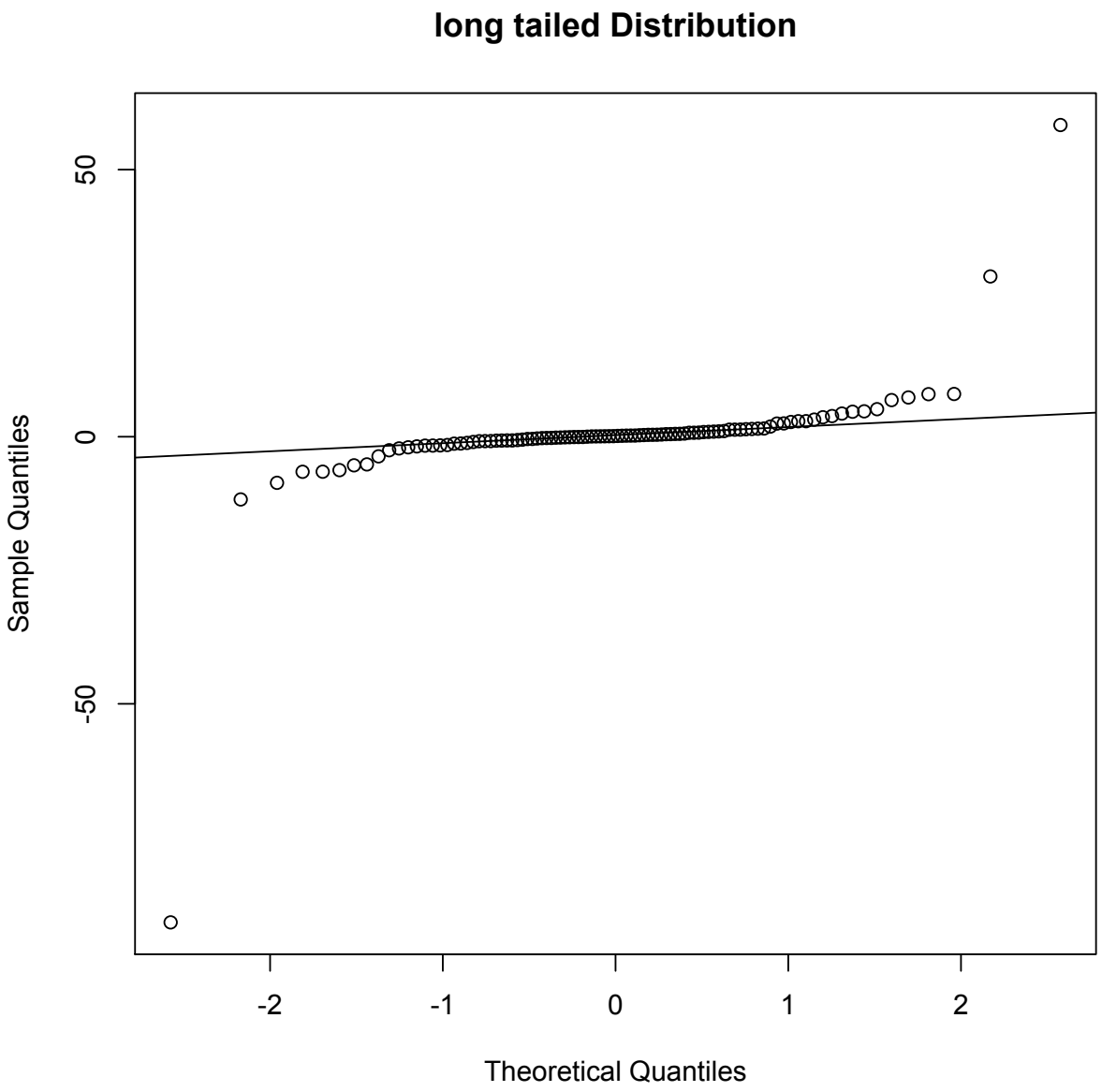


4 long
n = 100
right <- rexp(n,rate=2)
left <- rbeta(n,2,0.5,ncp=2)
short <- runif(n,min=0,max=2)
long <- rcauchy(n,location=0,scale=1)
RandomData <- long
title <- "long tailed Distribution"
quartz()
std<-sd(RandomData)
m <- mean(RandomData)
hist(RandomData, xlab="Data", freq = FALSE, main=title)
curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)
lines(density(RandomData, adjust=1),col = "red", lwd=2) # pdf
quartz()
qqnorm(RandomData,main=title)
qqline(RandomData)



This histogram has a sharp peak with outliers. It deviates from normal curve

The points generally have low slope near the center but high slope near the end. The QQ-plot suggests important deviations from normality.

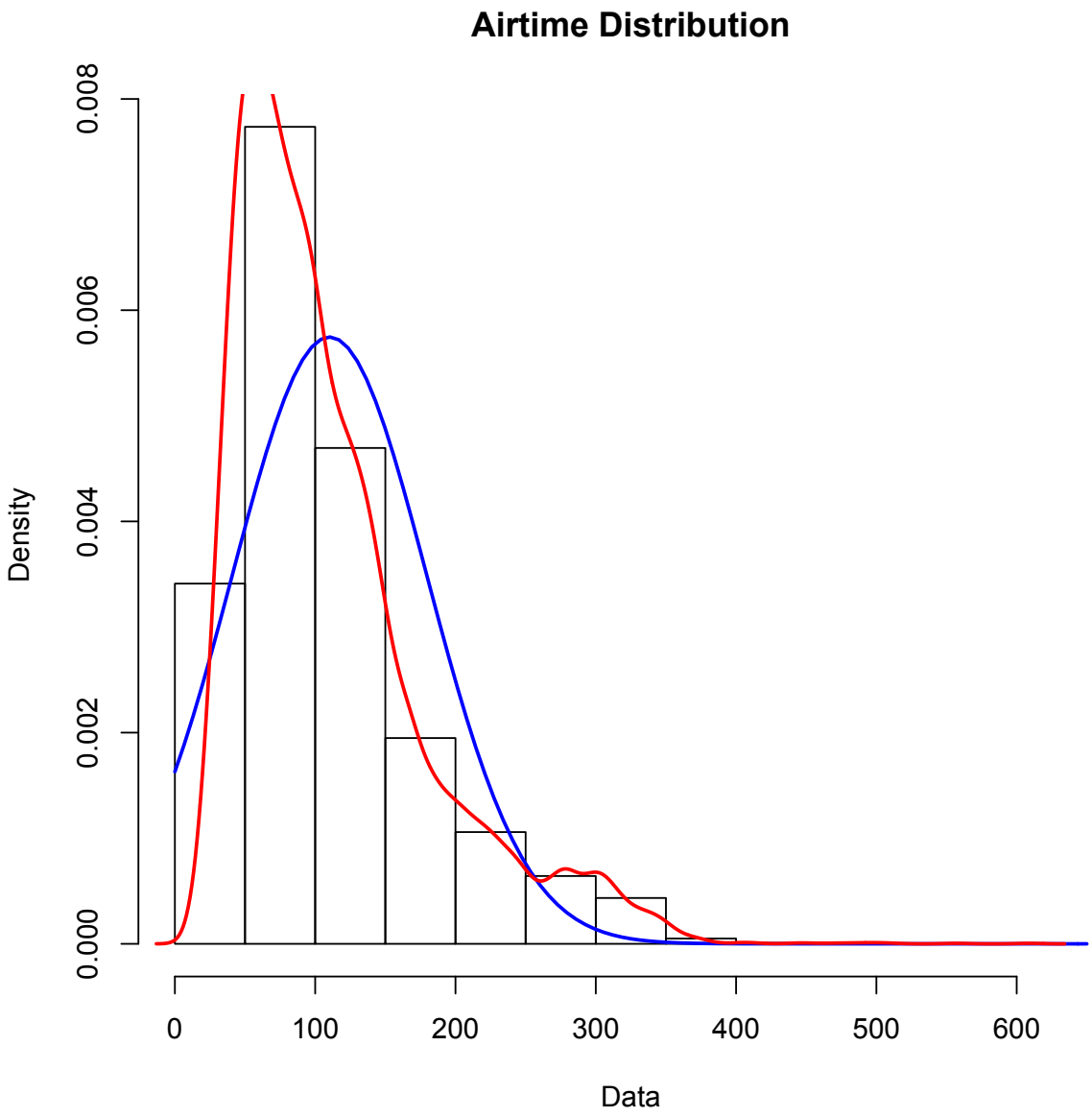


D

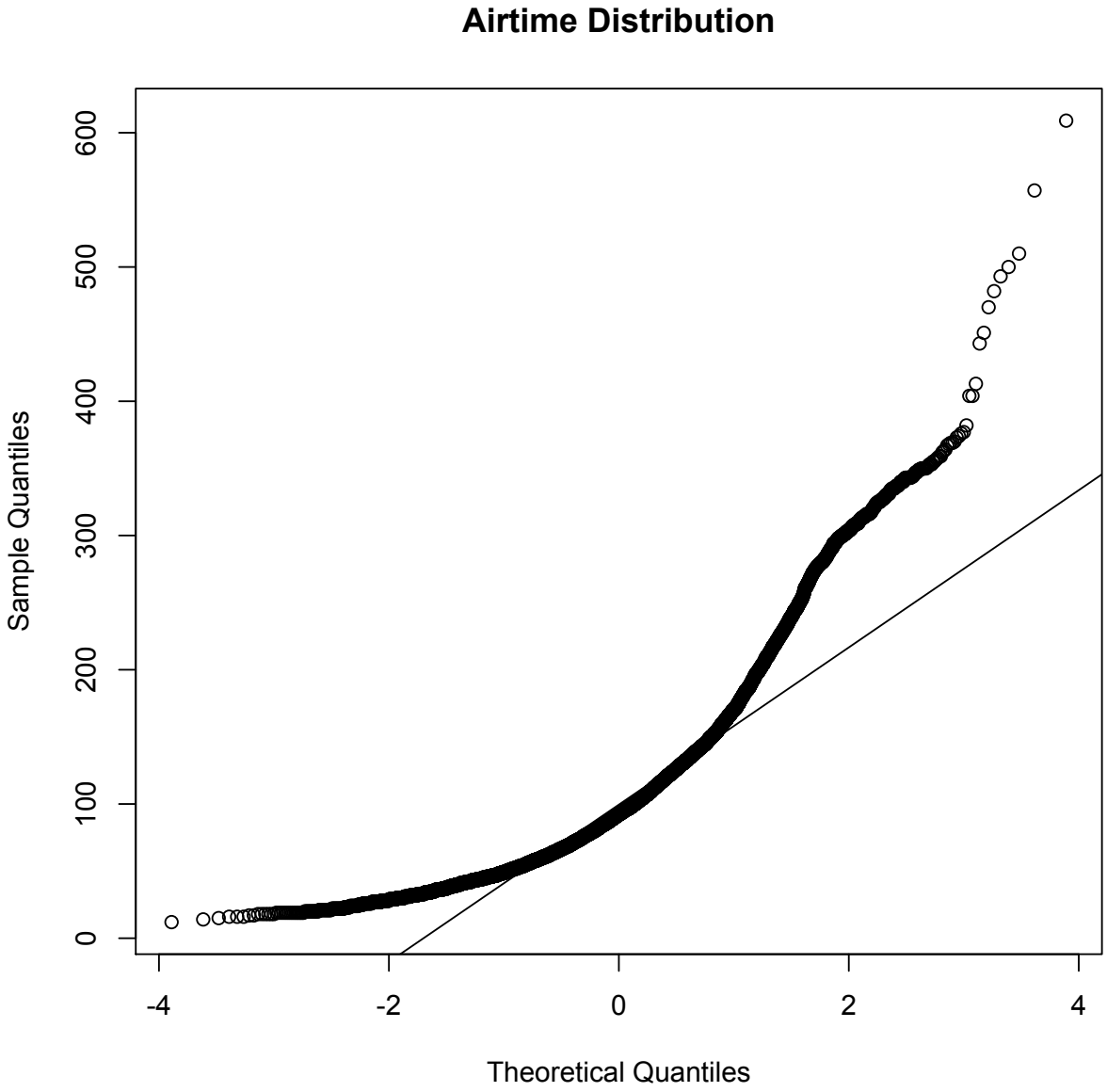
1.

```
airline_cleaned <- read.delim("~/Desktop/STAT350/STAT350/Labs/Lab2/airline_cleaned.txt")
RandomData <- AirTime
title <- "Airtime Distribution"
quartz()

#generating the histogram with blue line being the normal distribution # and red line the smoothed curve.
std<-sd(RandomData)
m <- mean(RandomData)
hist(RandomData, xlab="Data", freq = FALSE, main=title)


curve(dnorm(x, mean=m, sd=std), col="blue", lwd=2, add=TRUE)
lines(density(RandomData, adjust=1),col = "red", lwd=2)     # pdf
#Notice that we recommend that you use adjust = 3 here. However, if # this is too smooth, feel free to reduce that number lines(density(RandomData,adjust=3),col = "red", lwd=2)
quartz()
#plots the qqplot with line on a separate plot
qqnorm(RandomData,main=title)
qqline(RandomData)
```

2.



The shape of the histogram is right skewed. Because all the points are grouped in left side. The histogram deviates from the normal.



The plot is concave. So it is right skewed. The QQ-plot suggests important deviations from normality.

APPENDIX:

A
[1] -24.023956 7.130342 3.003139 9.185192 -3.563080 16.263516 5.227814 -6.215380 -14.601739
[10] 16.678912

B
[1] -1.4776565 -12.3738482 3.1255687 11.3117403 13.2204500 11.6262570 7.2387579 -6.5472015 1.3341132
[10] 3.9844632 4.1316212 1.9114929 11.7089067 18.4184492 1.0429579 -1.4067657 1.5664192 -14.2259660
[19] 12.3289686 21.3919197 3.4909161 -2.8083634 -1.1837600 1.9197390 3.5013317 -12.5078344 -18.6199725
[28] 7.4402524 11.2522802 -2.7313176 19.8629063 14.9457145 -8.9414262 -1.2753957 10.1804617 9.2116320
[37] 13.4300801 15.7717087 1.3090086 19.6212121 10.6441444 -0.9461913 9.1236557 0.8237615 4.6884569
[46] -2.1021674 12.3320866 4.7603272 31.1205553 -3.7597324 31.2165929 5.8753405 7.3617210 -3.9126702
[55] 8.7962859 26.4183145 -19.5689940 -6.4264762 13.0504394 -0.7582144 -12.3119051 -0.5031156 24.4553276
[64] 0.1434277 7.9499037 -8.6786612 -11.0566456 -20.7731491 12.3342128 -11.1958355 -16.4185620 22.4223307
[73] 4.4435413 6.8781629 -14.6004682 1.9665544 16.2738103 31.6392621 21.1083215 -13.8348235 4.0892052
[82] 9.1683018 11.5825701 5.7853425 -7.5093766 -26.9144759 -6.4748296 23.2226045 2.5269541 16.8214287
[91] 29.7780712 -10.1791317 8.2863451 -14.7969142 -1.0077656 7.1363701 22.5104230 -6.9911250 2.2451760
[100] 8.2153923

C
Right:
> right
[1] 0.3718308792 1.1644447045 0.4183554917 0.5061374977 0.4232163746 1.1547673316 0.4531148532 0.2532230683
[9] 0.2738801939 0.2726998793 0.1605680531 0.3935565501 0.6538938749 0.5411508642 0.0932897143 1.2361060911
[17] 1.0047232452 0.0713139690 0.1835962543 0.1777330190 0.3287963721 0.3611045016 0.4358099387 0.2234458434
[25] 0.8737453837 0.0875335083 1.2287742895 0.2277042309 1.0428705410 0.2952327173 0.2255200769 1.0248238537

[33] 0.0140263608 0.4122979389 1.6640216074 0.0022956510 0.3768087525 0.5320867188
1.1307174773 0.7192585310
[41] 0.1455672784 0.5590144987 0.3022842840 0.8373672822 0.5431472631 1.4233166873
0.5660966262 1.0214518671
[49] 0.0918312877 0.2663930911 0.1077928303 0.6304323477 0.5534053296 0.4859545165
0.4806972155 0.0551442497
[57] 0.2667868434 0.1822239836 0.9259202609 0.2483088751 0.1995529125 0.1096247882
0.7127621954 0.4089844170
[65] 0.3649277228 0.5150721017 1.0583202483 2.3874460551 0.2397472789 0.1254663956
0.9229871481 0.0884307306
[73] 0.2835775565 0.1399383645 0.0158002456 0.3314596638 0.3582033794 0.0009566906
0.0299266845 0.2671039857
[81] 1.1501408138 0.9662346970 0.2085673020 0.0392222755 0.0315861385 0.3620814679
0.4477376537 0.0285295797
[89] 0.0642090417 0.4865262471 0.0267454793 0.1609009048 1.5939698589 0.5044688750
0.1628032669 0.4495984907
[97] 0.3788270061 0.7465200292 0.0912101229 1.0499435620

> left
[1] 0.9194937 0.9899590 0.9999976 0.9111988 0.9314515 0.8298416 0.8822406 0.8226555
0.9695001 0.6430309
[11] 0.9819778 0.3169000 0.8352348 0.8927650 0.9994010 0.9801780 0.8889894 0.7109231
0.9999987 0.9941636
[21] 0.9788814 0.9962505 0.6885011 0.9031981 0.9674325 0.9126387 0.9405487 0.9738251
0.9644365 0.9929590
[31] 0.9653564 0.9824604 0.5506505 0.2961881 0.9731205 0.9786137 0.9382974 0.9975159
0.8457900 0.3889353
[41] 0.9882316 0.9993535 0.9773432 0.9838330 0.6919758 0.9823929 0.9103350 0.8367375
0.9988373 0.9504504
[51] 0.9792229 0.8209837 0.9946027 0.8698079 0.8370886 0.7210463 0.5723389 0.6793938
0.9982230 0.8244343
[61] 0.6176384 0.9709910 0.9997277 0.7409217 0.6877296 0.7793432 0.4402493 0.9736379
0.5972724 0.7669308
[71] 0.8494588 0.6063290 0.9001547 0.8934902 0.9857189 0.6386016 0.9966972 0.9999862
0.9094138 0.2122866
[81] 0.9967888 0.9687362 0.9077699 0.9659049 0.6911444 0.9646612 0.7534136 0.6372083
0.9230705 0.8732785
[91] 0.7140132 0.9960113 0.9032413 0.9830570 0.7333078 0.9983594 0.2727649 0.9949895
0.9469767 0.9286531

> short
[1] 0.950107699 1.575052906 1.092112120 1.429682272 0.426259826 1.569014356
0.904821825 1.330563914 0.571183409

[10] 0.583981692 1.708112569 0.771152479 0.124546617 0.669338009 0.340009169
0.333509443 0.882094842 1.052624579
[19] 1.563928079 1.654523610 1.956961507 0.005702158 1.354241349 1.815841551
1.032389407 0.048669655 0.624413488
[28] 0.312937621 0.255116706 1.687981130 1.859238627 1.968353045 1.730049562
0.733380873 1.402160034 0.827603316
[37] 0.484363698 0.478236489 0.089207463 1.568162407 1.701332845 0.557799144
0.882371422 1.365775467 1.424021970
[46] 0.301595751 1.568007591 1.440251773 1.055888987 0.252125096 0.485047306
0.468597888 0.347379432 0.924097181
[55] 1.179166188 1.836763384 1.043094607 0.416395185 0.081756668 0.209852947
1.758904273 1.820121592 1.370665454
[64] 1.063875997 1.784715206 0.398421592 0.392622167 1.495148946 1.044522815
0.761215559 0.944634638 1.779079684
[73] 0.844265746 1.238234372 1.731934986 0.116089762 0.703517106 0.358656067
0.266710800 1.052076667 0.116430325
[82] 1.809261375 1.778869482 1.802086850 1.053893499 1.839309626 0.405028231
0.177481196 0.237323402 1.800027599
[91] 0.244092541 0.993985723 1.820958740 1.873208500 1.057585482 1.574839968
1.148791652 1.712549945 0.422049357
[100] 0.005280854

> long
[1] 0.01029580 -90.91363493 0.10904814 -0.84349766 4.68226433 -1.27221442
0.99889279 -0.41210536
[9] 1.54289275 -0.69265432 -0.15164258 -5.35480834 3.64440134 -6.54631894 -
0.62271191 -2.19111062
[17] 1.06009808 -0.69293652 -0.32561925 2.75778111 -8.62628021 0.35778982
3.87105953 0.59393073
[25] -0.08984362 1.45104468 0.48887587 1.31788266 6.85827074 -2.53063297
3.20519307 0.53975460
[33] 0.77097208 0.35027783 -0.98354332 -1.55237934 -0.54101149 7.34971972
2.91025188 -0.82539073
[41] 0.31181213 0.37118382 0.14875821 -1.62589050 -0.81792209 1.32350302 -
11.73917238 0.09907758
[49] 1.50833758 30.00675044 -1.65718800 2.49075791 4.33573314 -0.23515597
4.75647851 0.21496570
[57] -5.18160937 0.87329972 0.17867733 -1.98383101 2.90002272 0.47713228 -
0.04553133 0.41350777
[65] -6.25499854 -1.30303681 -0.17363013 0.74467537 0.21979067 1.33455037
0.06260646 -1.15716983
[73] -1.67140530 1.90291169 0.52521037 7.96620772 -0.26060129 0.08517958 -
0.11366620 -0.73699576

[81] 2.46311328 0.74020594 -0.42619500 1.40650269 -0.05953048 58.35279780 -0.71568178 5.15687986
[89] 0.95469797 0.20326264 0.90928879 -3.67386698 -0.22514509 0.27430329 0.07202534 8.00252928
[97] 0.05208311 -0.05335283 -1.81041511 -6.56282750