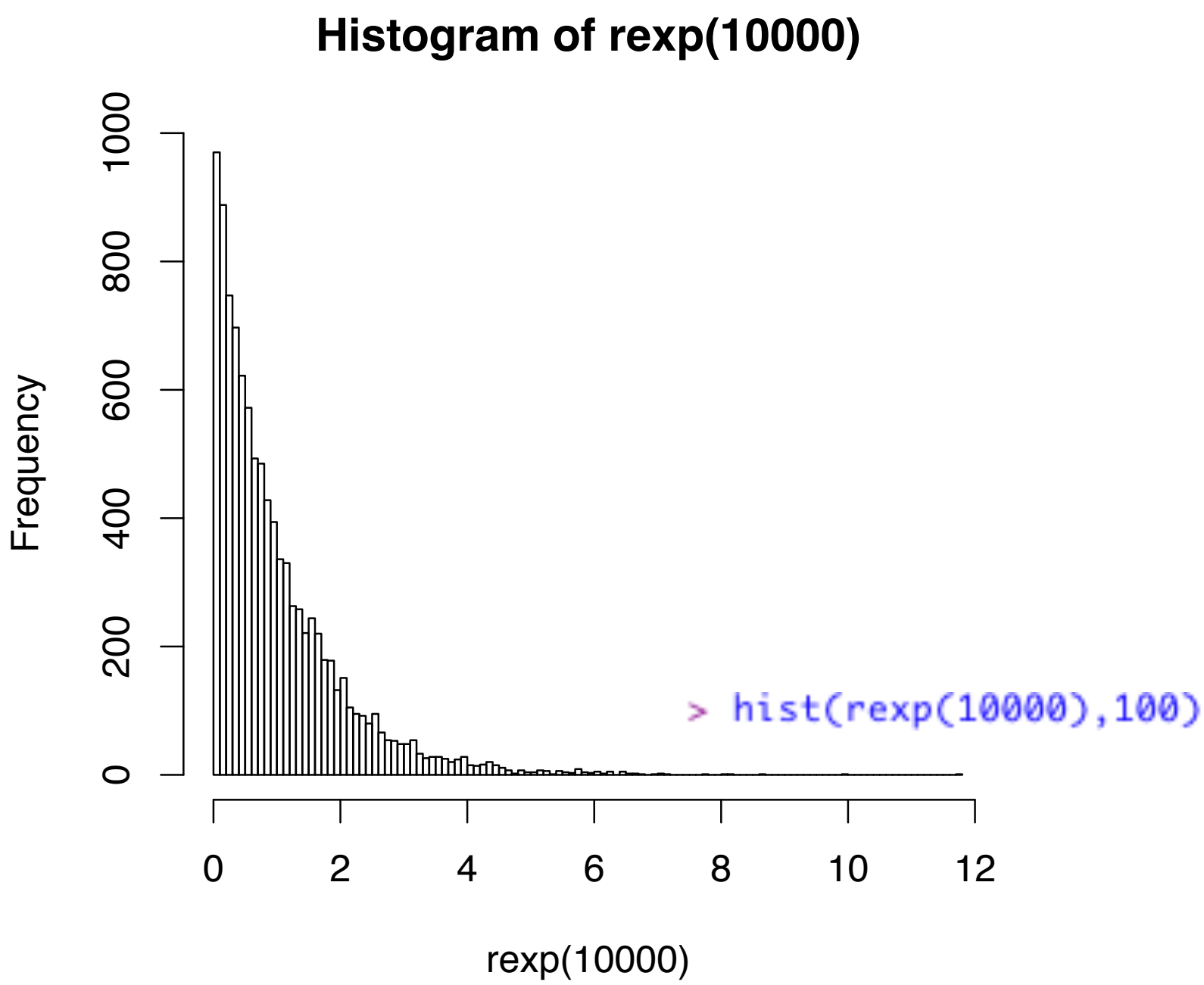
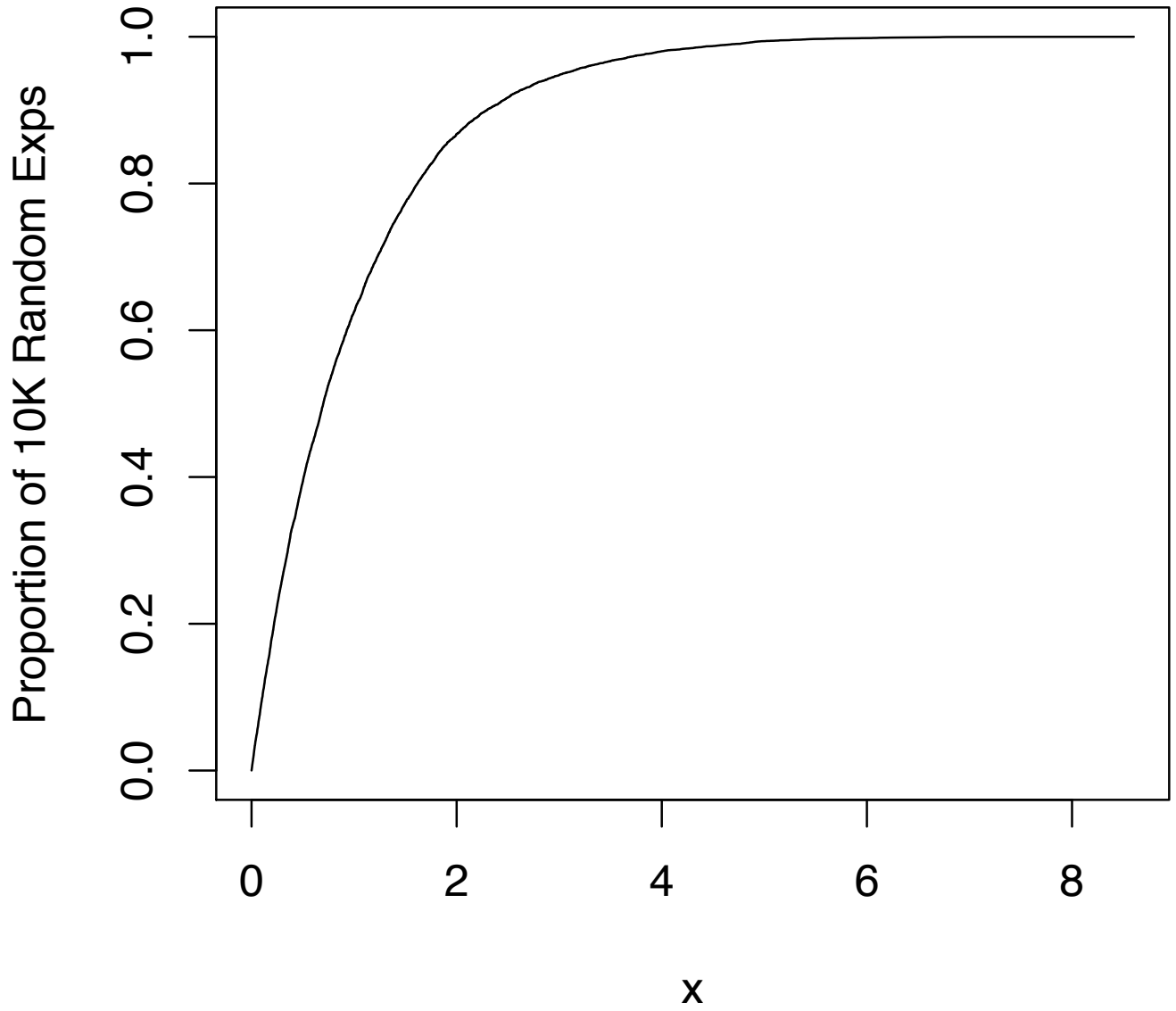
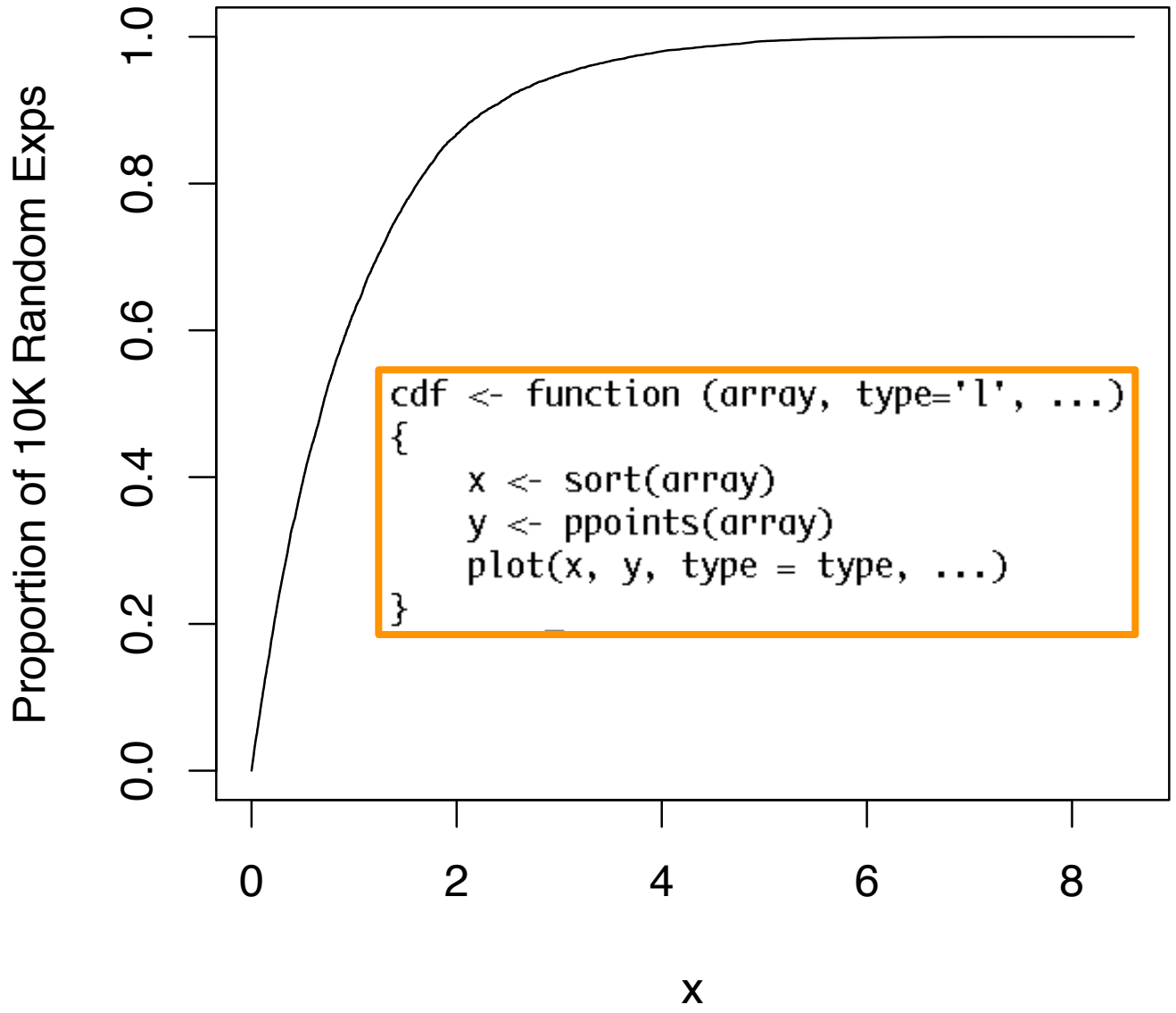
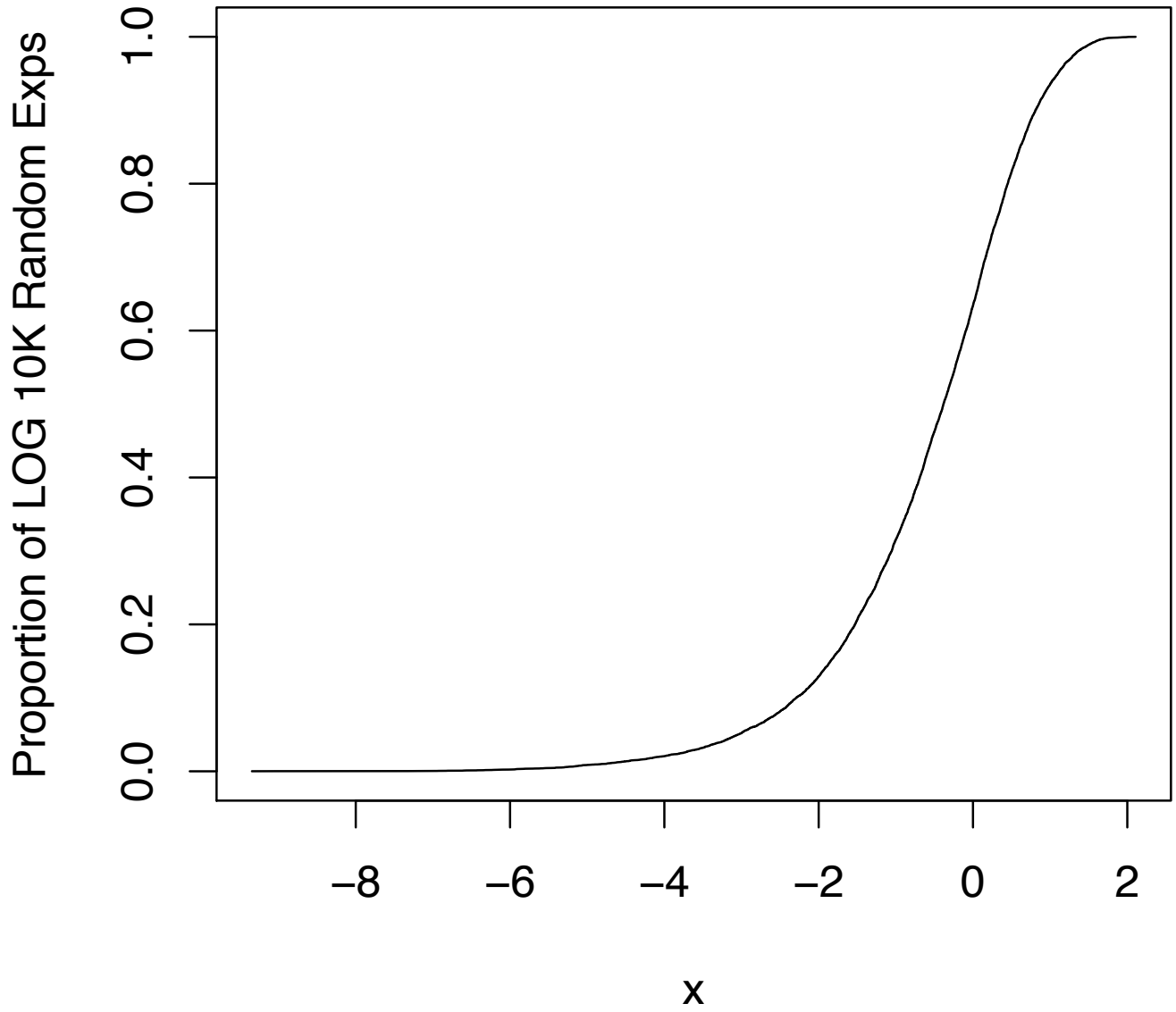
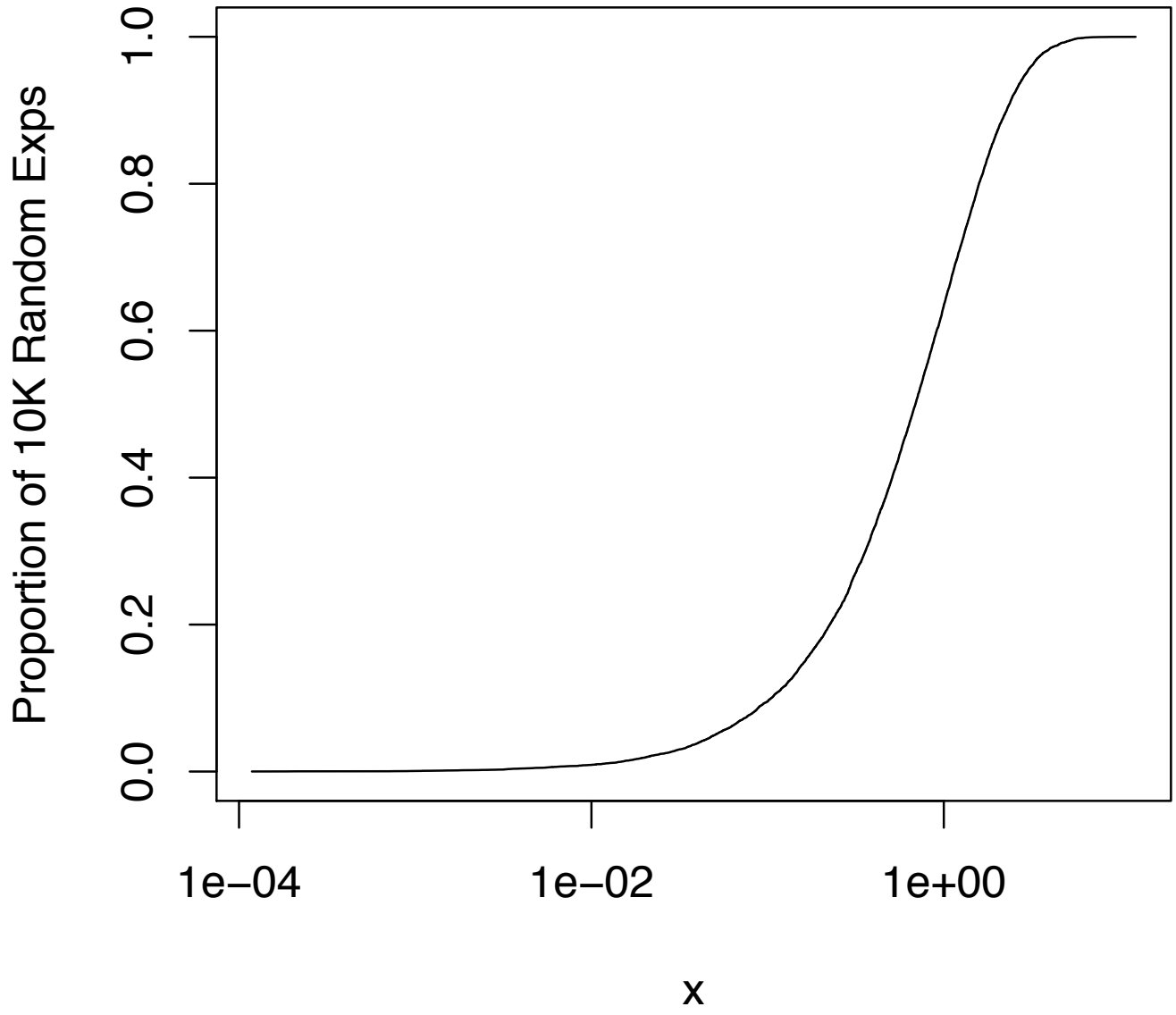

Histogram of rexp(10000)
Frequency
0
200
400
600
800
1000
0
2
4
6
8
10
12
rexp(10000)
> hist(rexp(10000),100)

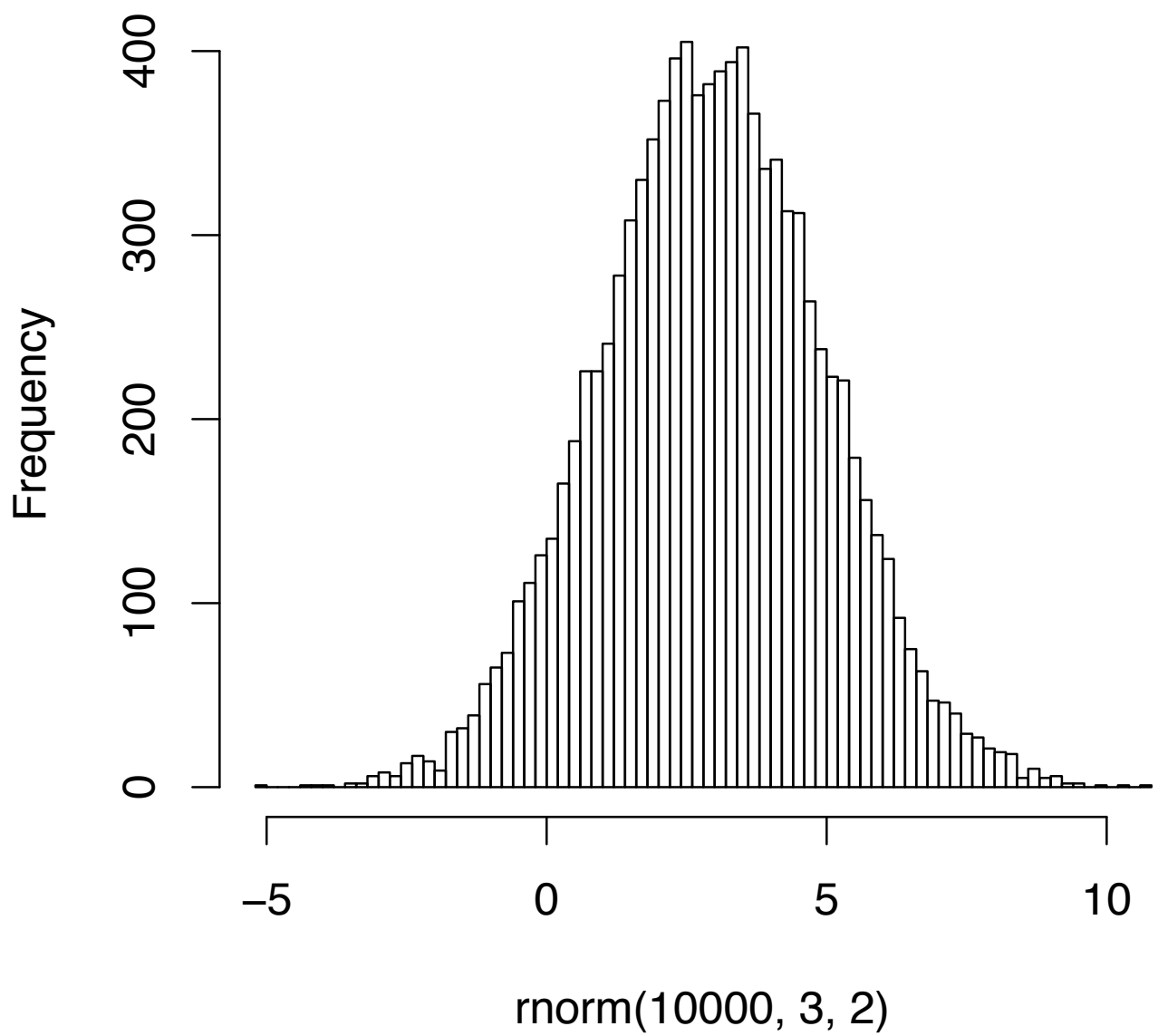

Proportion of 10K Random Exps
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
x

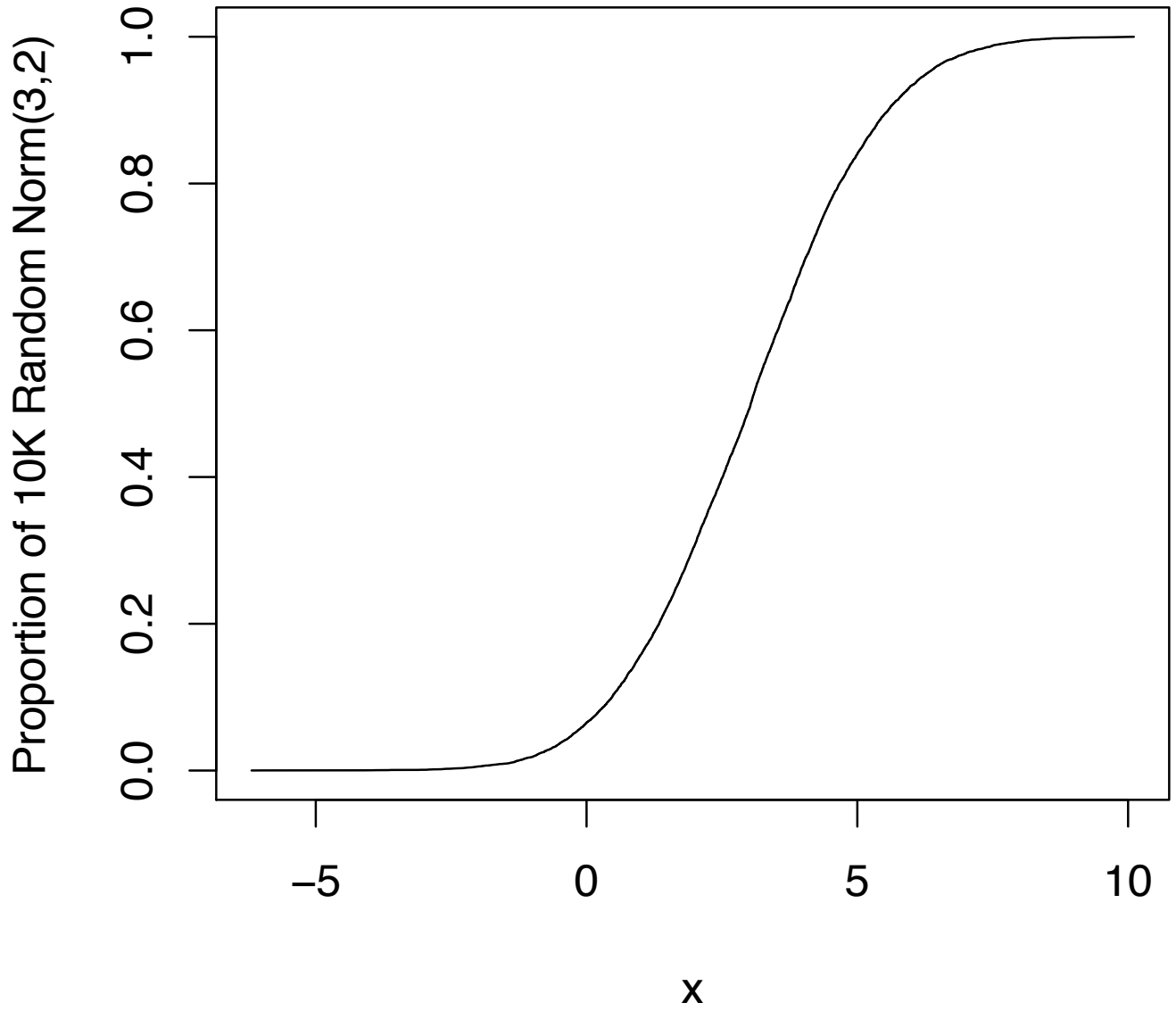

Proportion of 10K Random Exps
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
x
cdf <- function (array, type='l', ...)
{
x <- sort(array)
y <- ppoints(array)
plot(x, y, type = type, ...)
}

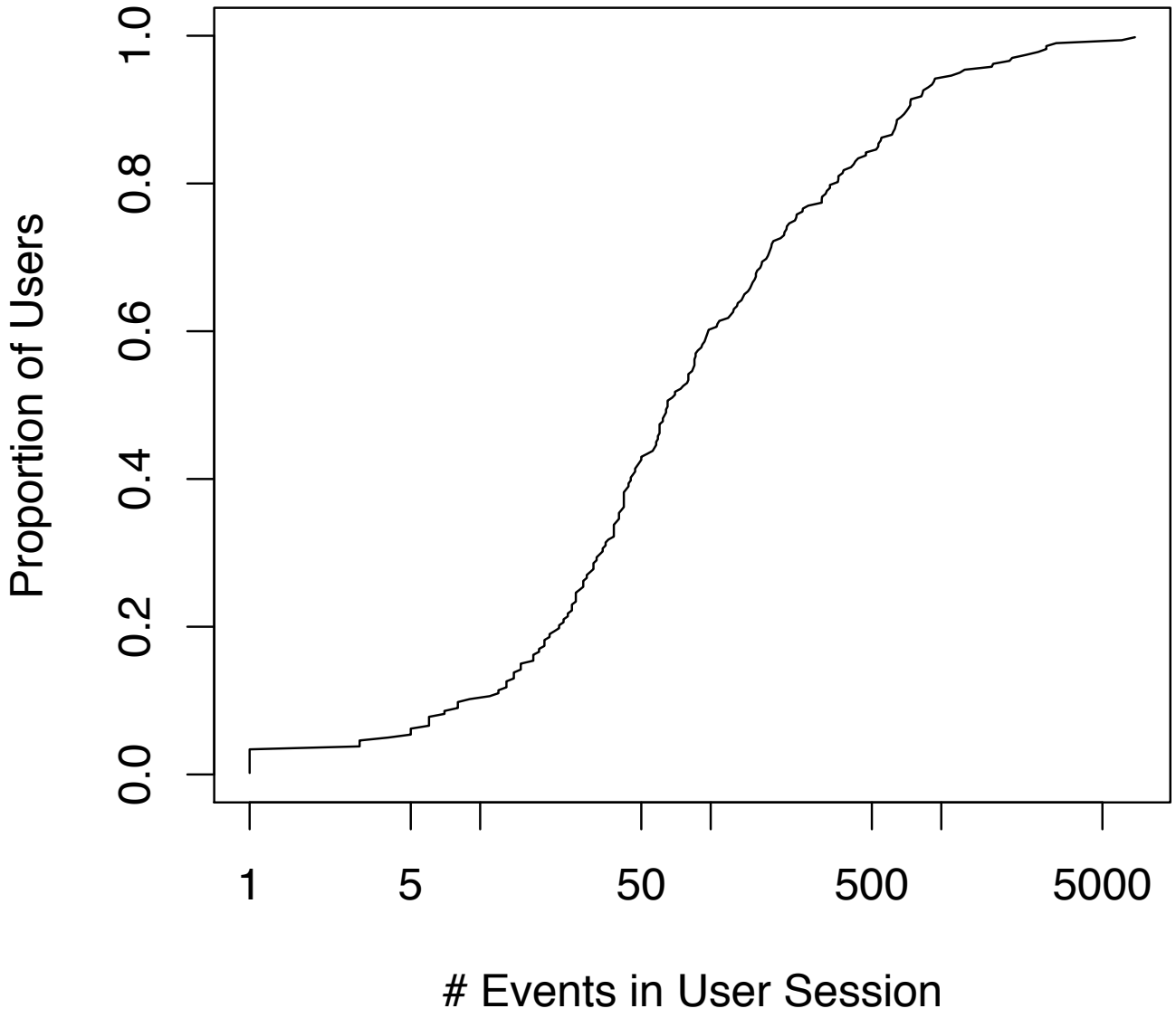

Proportion of LOG 10K Random Exps
0.0
0.2
0.4
0.6
0.8
1.0
−8
−6
−4
−2
0
2
x

```
> cdf(rexp(10000), ylab="Proportion of 10K Random Exps",log='x')
```

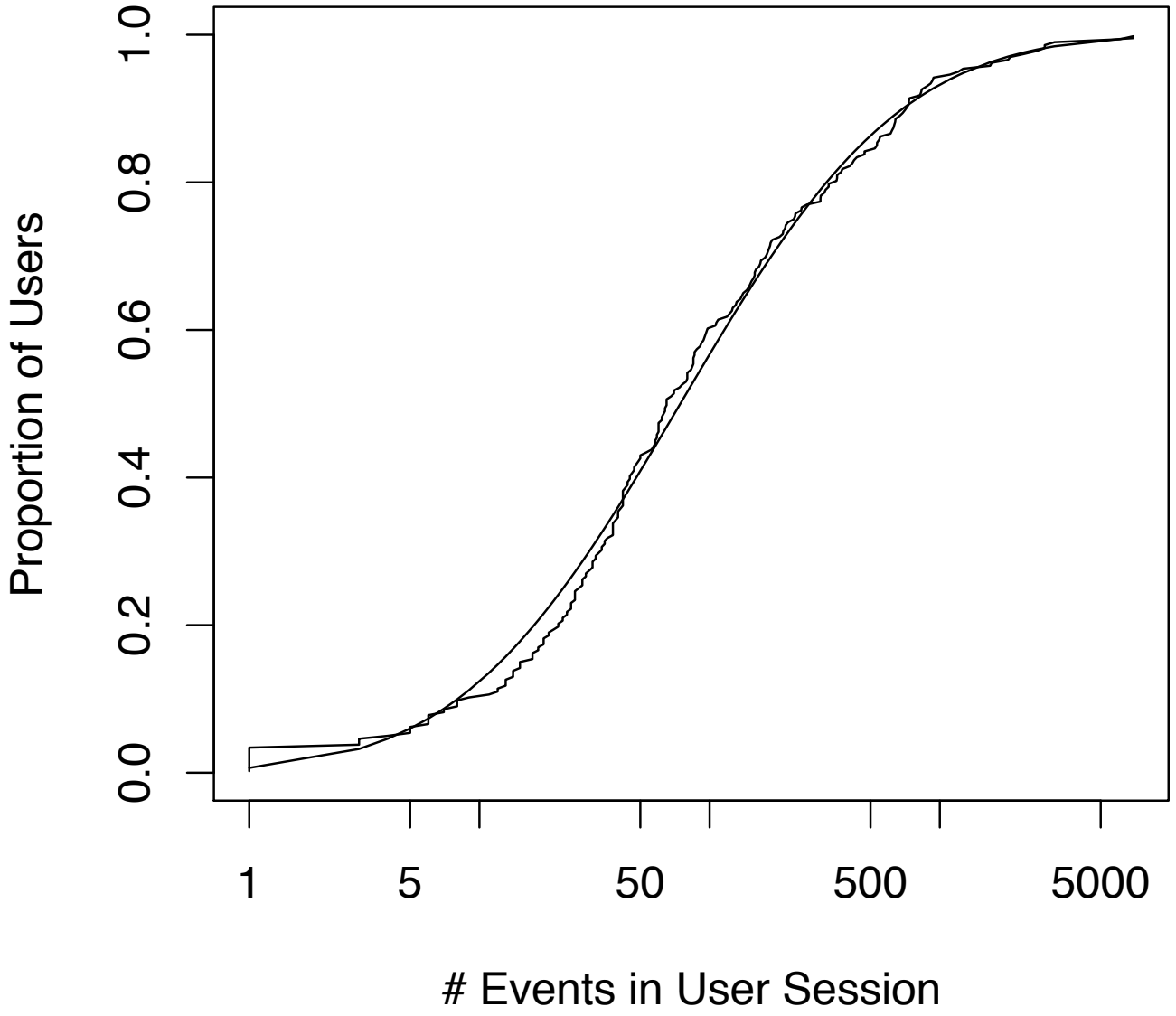


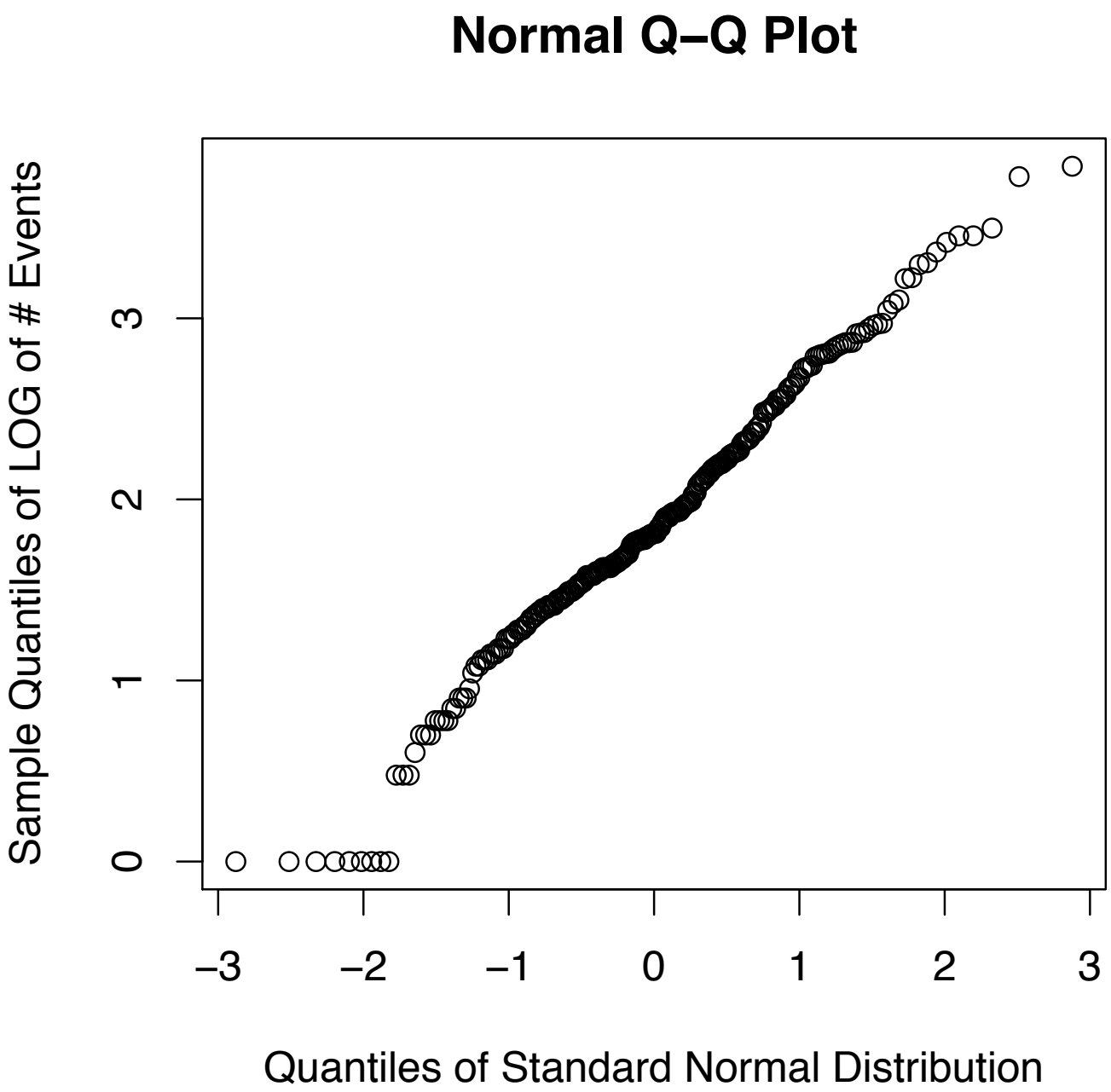

Histogram of rnorm(10000, 3, 2)
Frequency
0
100
200
300
400
−5
0
5
10
rnorm(10000, 3, 2)

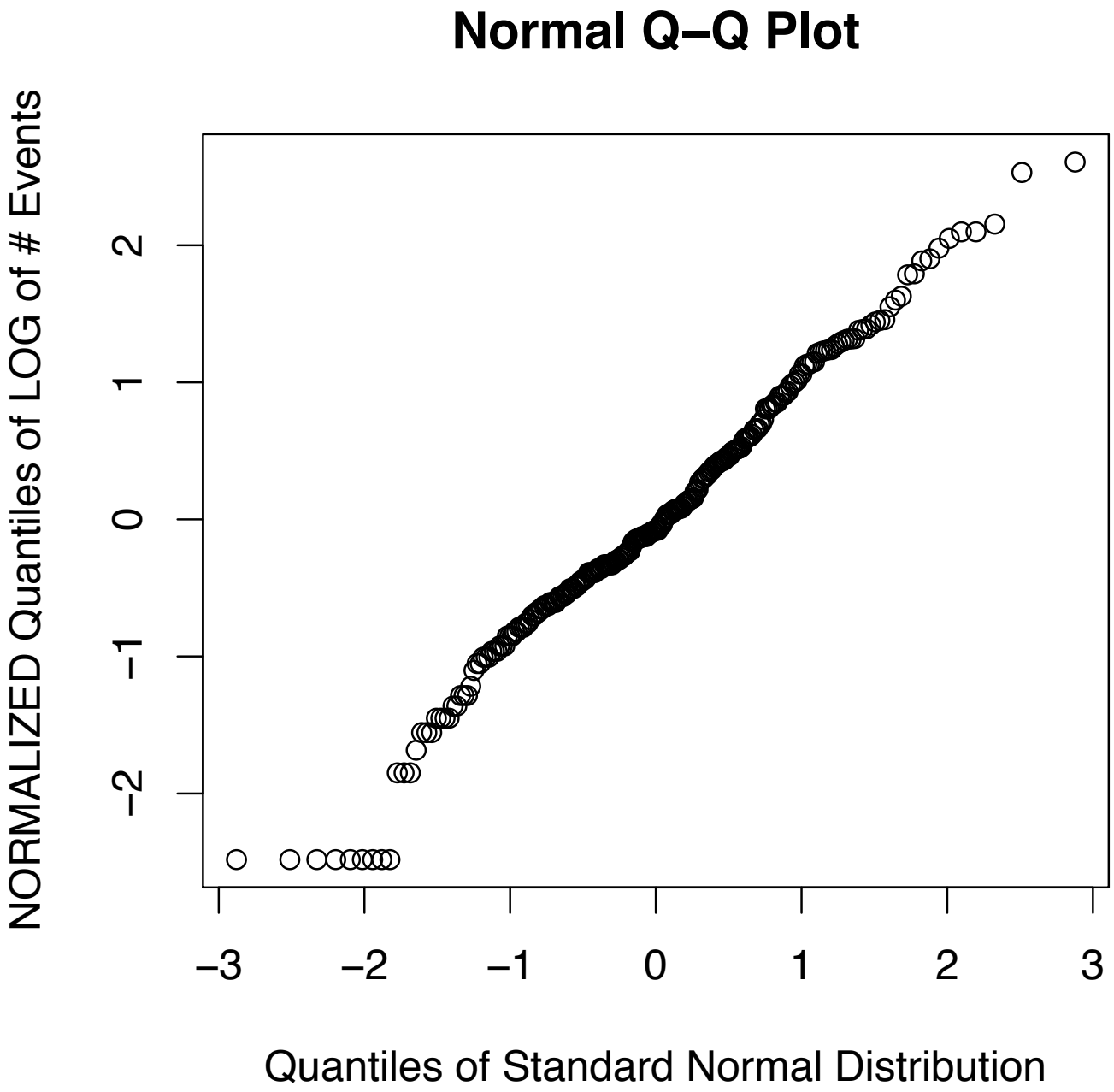

Proportion of 10K Random Norm(3,2)
0.0
0.2
0.4
0.6
0.8
1.0
−5
0
5
10
x

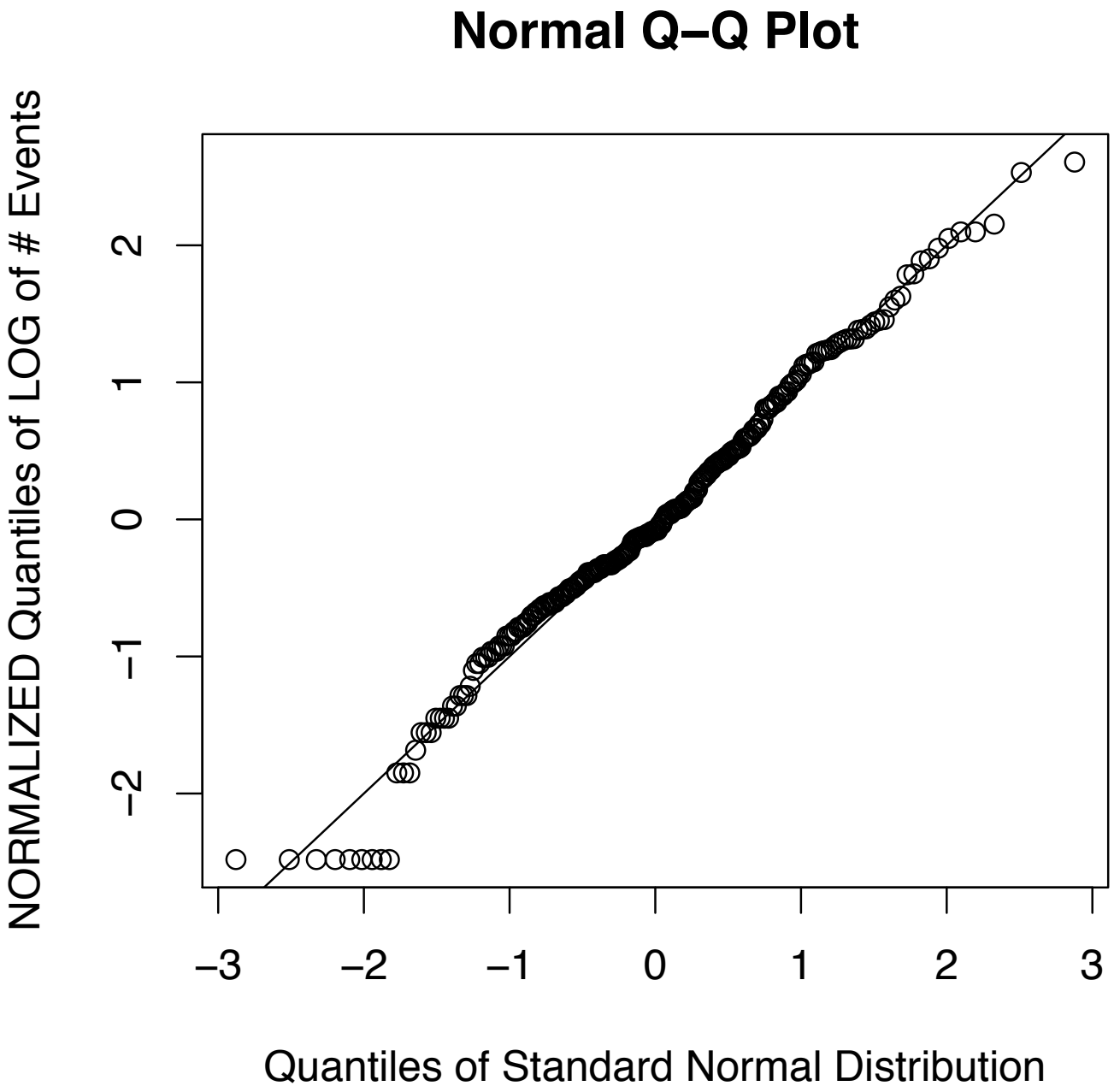

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1
5
50
500
5000
Events in User Session

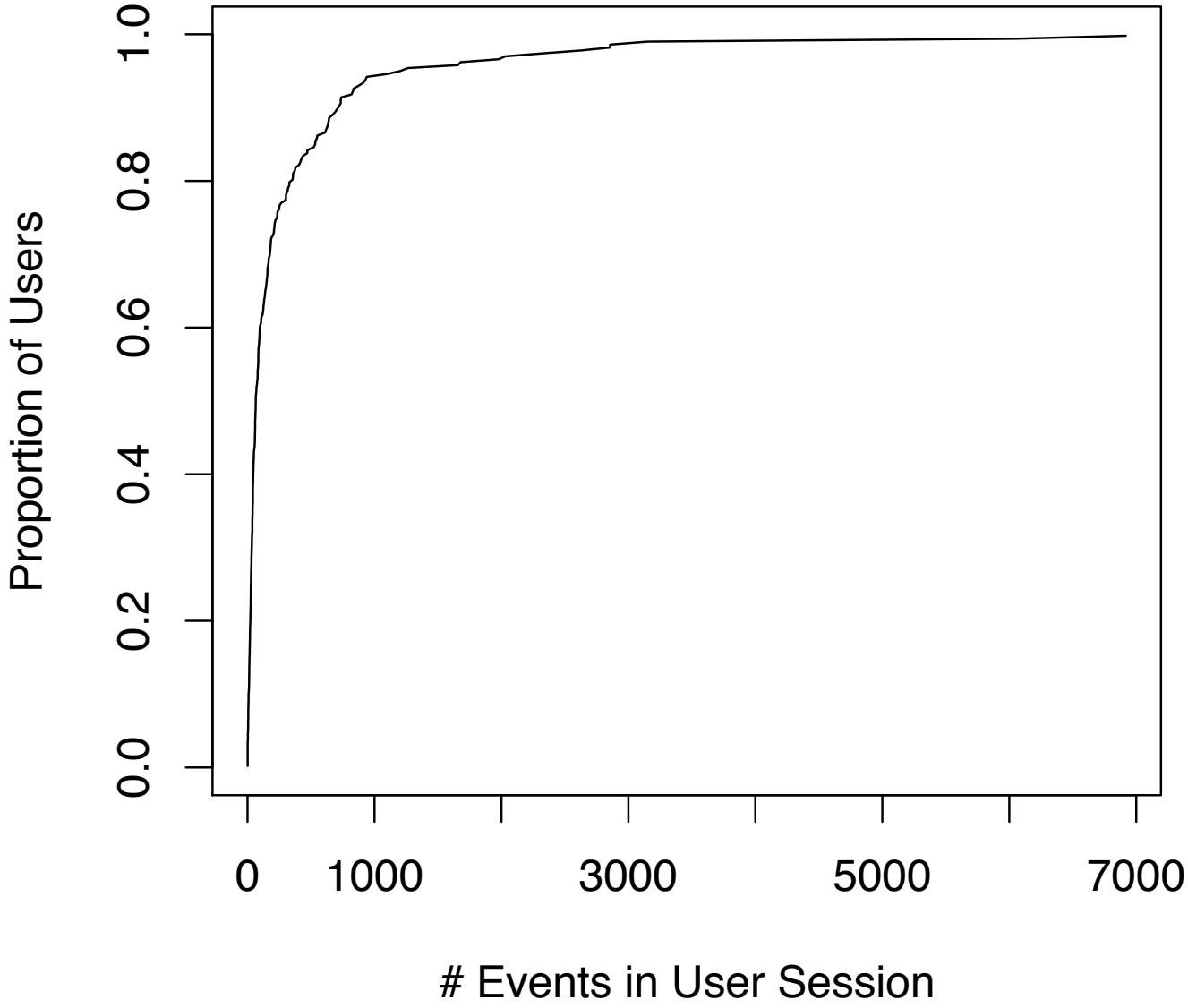
```
> cdf(my.data, log='x')
> fit.q <- ppoints(my.data)
> fit.x <- exp(qnorm(fit.q, mean(log(my.data)), sd(log(my.data))))
> lines(fit.x, fit.q)
```

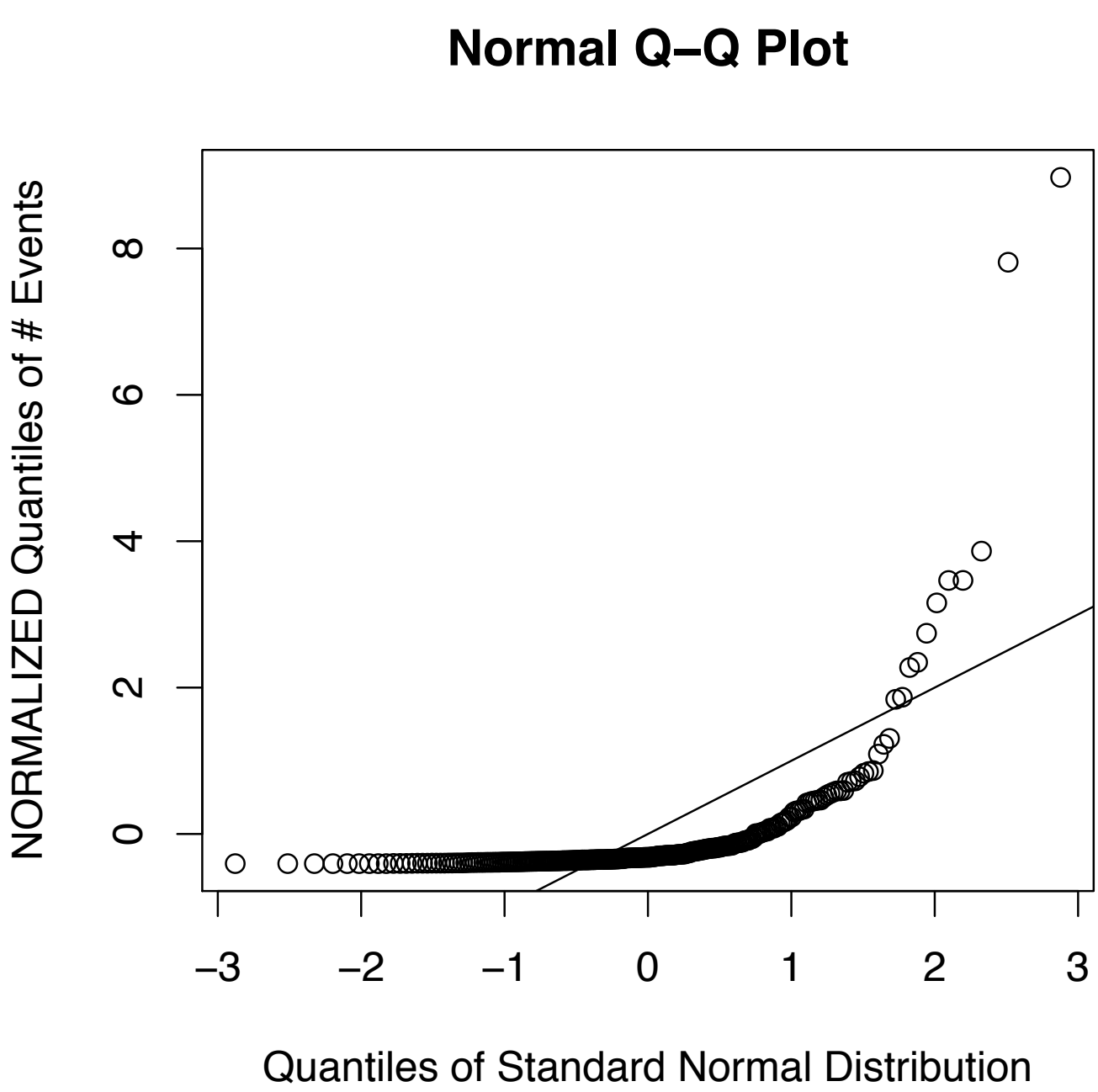


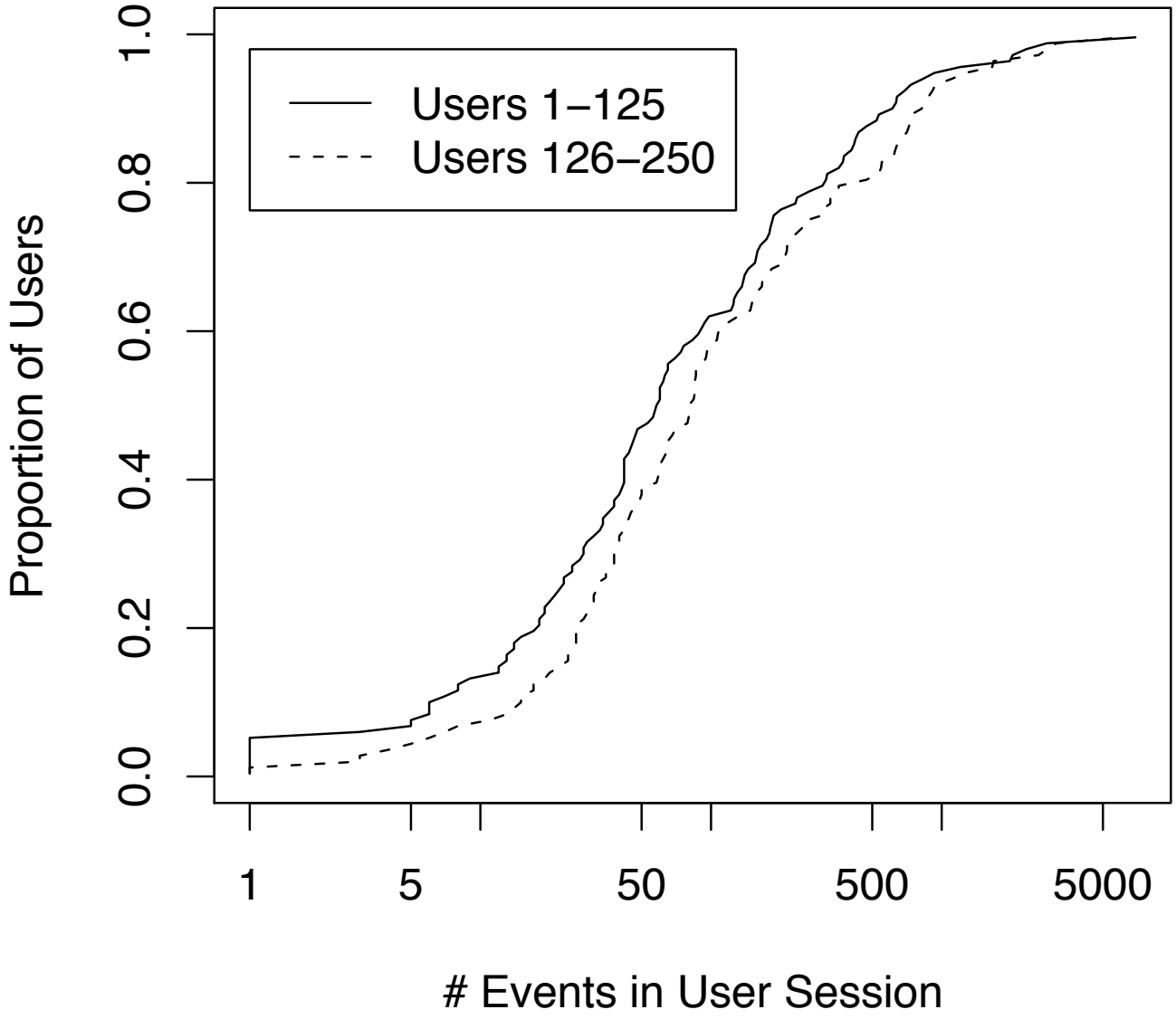

Normal Q–Q Plot
Sample Quantiles of LOG of # Events
0
1
2
3
–3
–2
–1
0
1
2
3
Quantiles of Standard Normal Distribution


Normal Q–Q Plot
NORMALIZED Quantiles of LOG of # Events
Quantiles of Standard Normal Distribution
−3
−2
−1
0
1
2
3
−2
−1
0
1
2

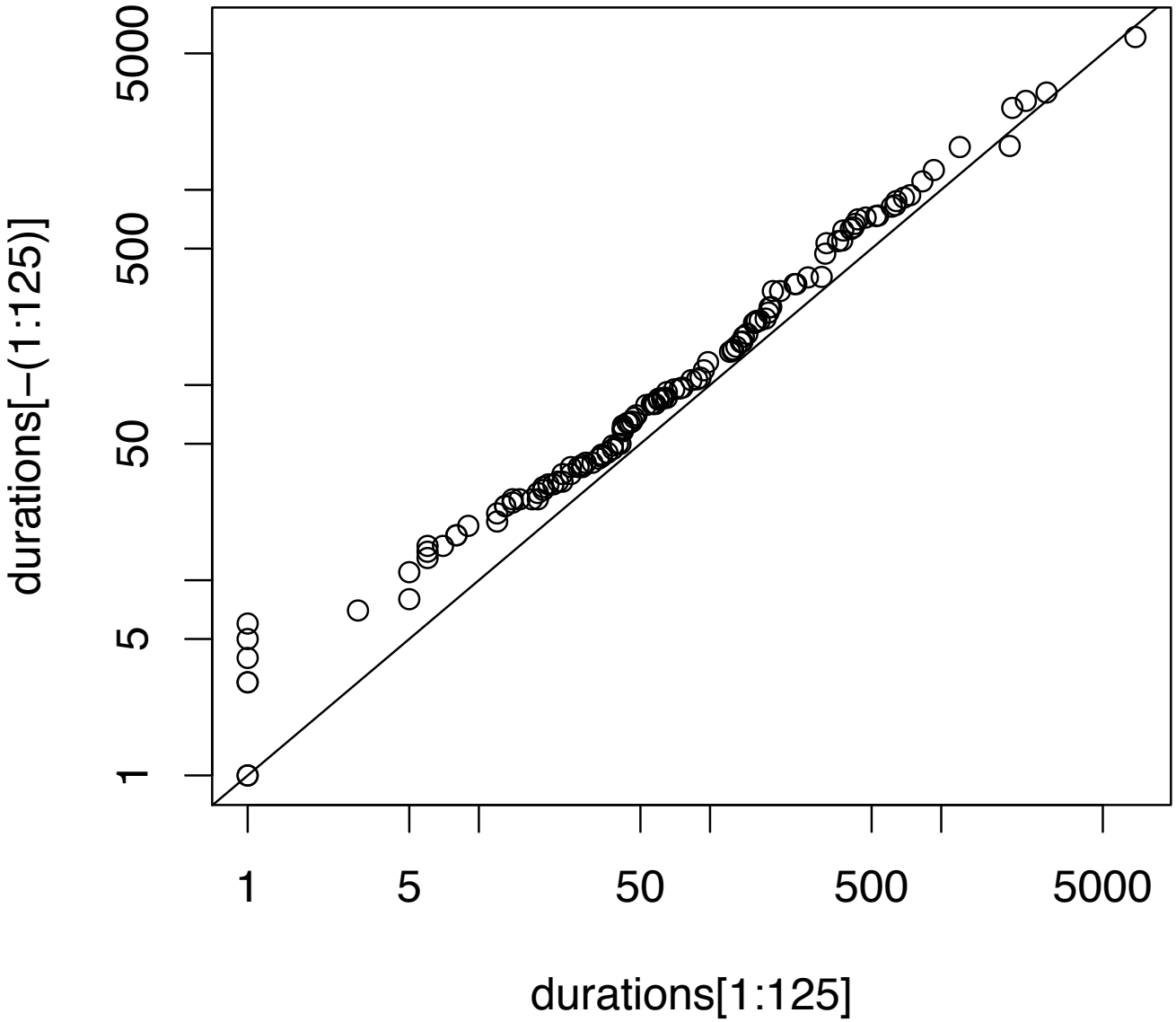

Normal Q–Q Plot
NORMALIZED Quantiles of LOG of # Events
Quantiles of Standard Normal Distribution
−3
−2
−1
0
1
2
3
−2
−1
0
1
2

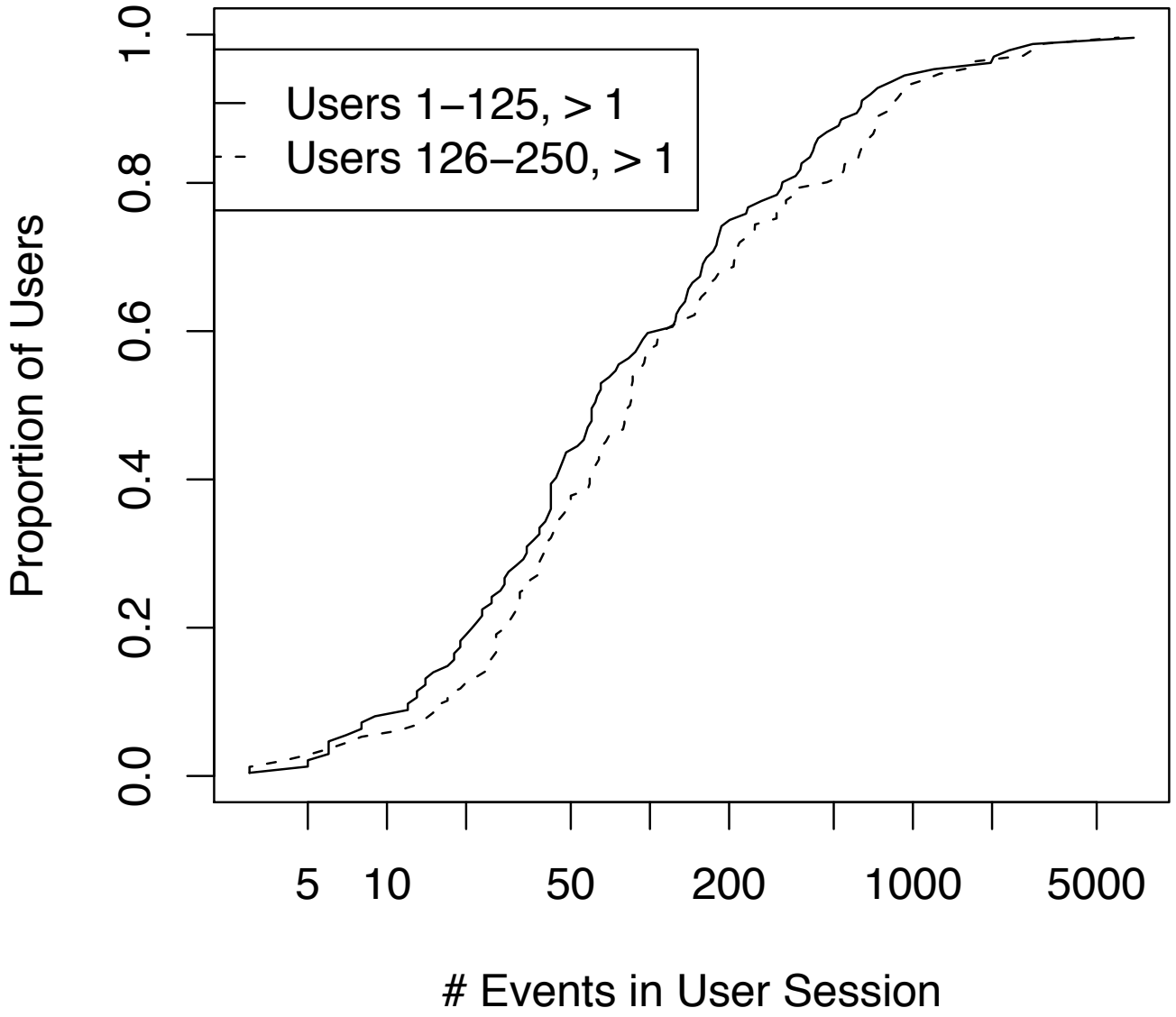

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
0
1000
3000
5000
7000
Events in User Session

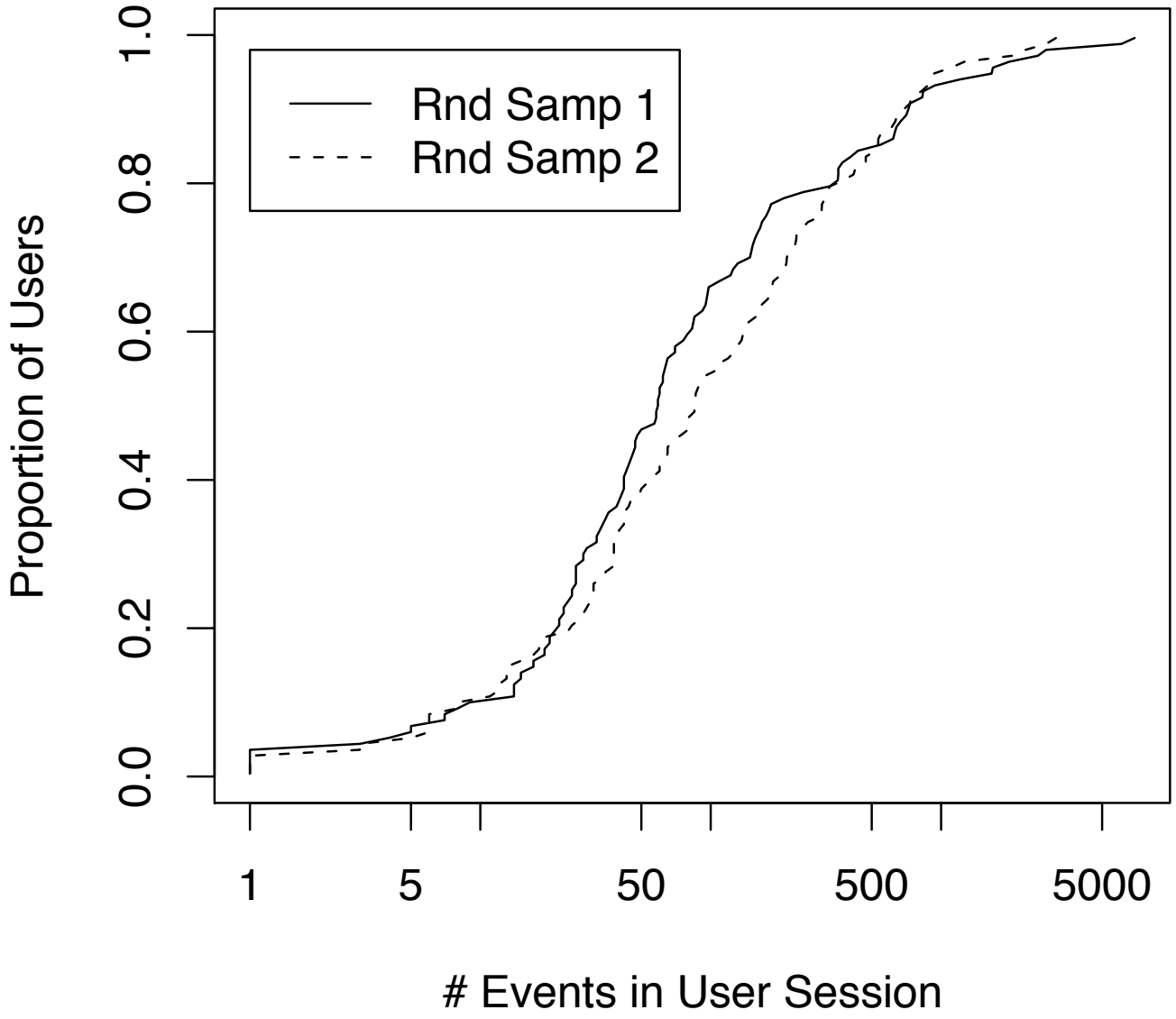

Normal Q–Q Plot
NORMALIZED Quantiles of # Events
0
2
4
6
8
–3
–2
–1
0
1
2
3
Quantiles of Standard Normal Distribution


Users 1–125
Users 126–250
Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1
5
50
500
5000
Events in User Session

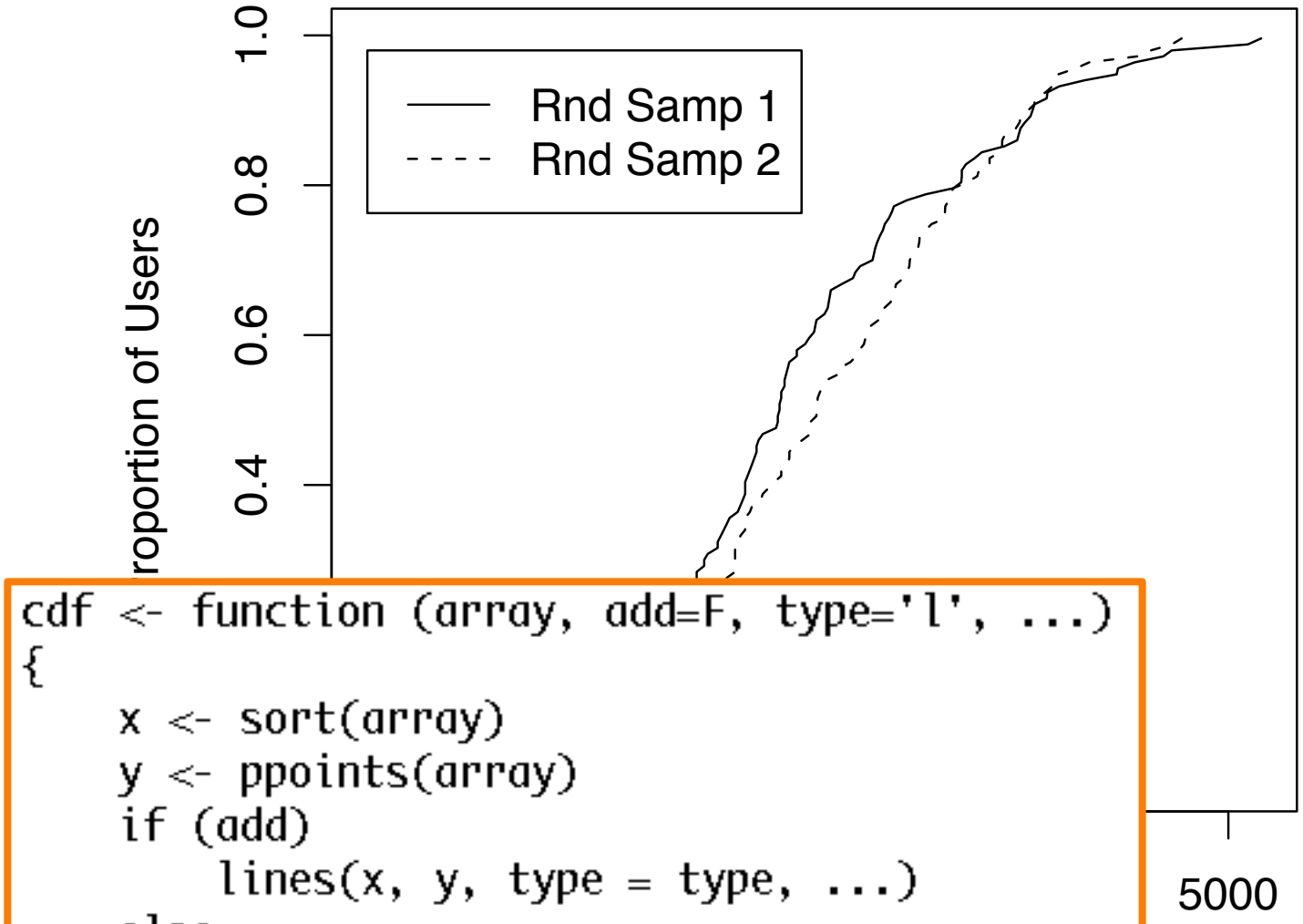
```
> qqplot(durations[1:125], durations[-(1:125)], log='xy')
> abline(0,1)
```



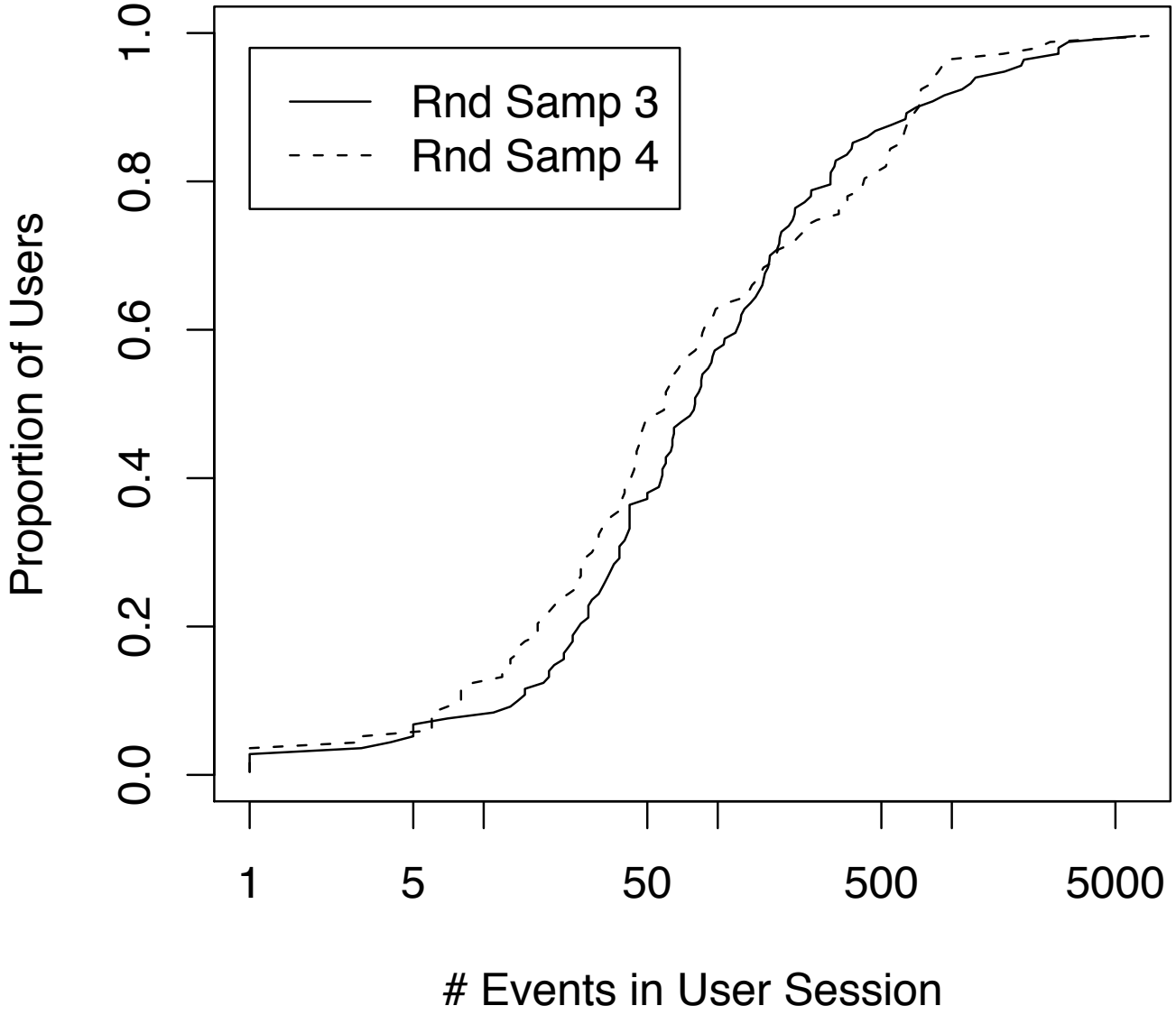

Users 1–125, > 1
Users 126–250, > 1
Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
5
10
50
200
1000
5000
Events in User Session

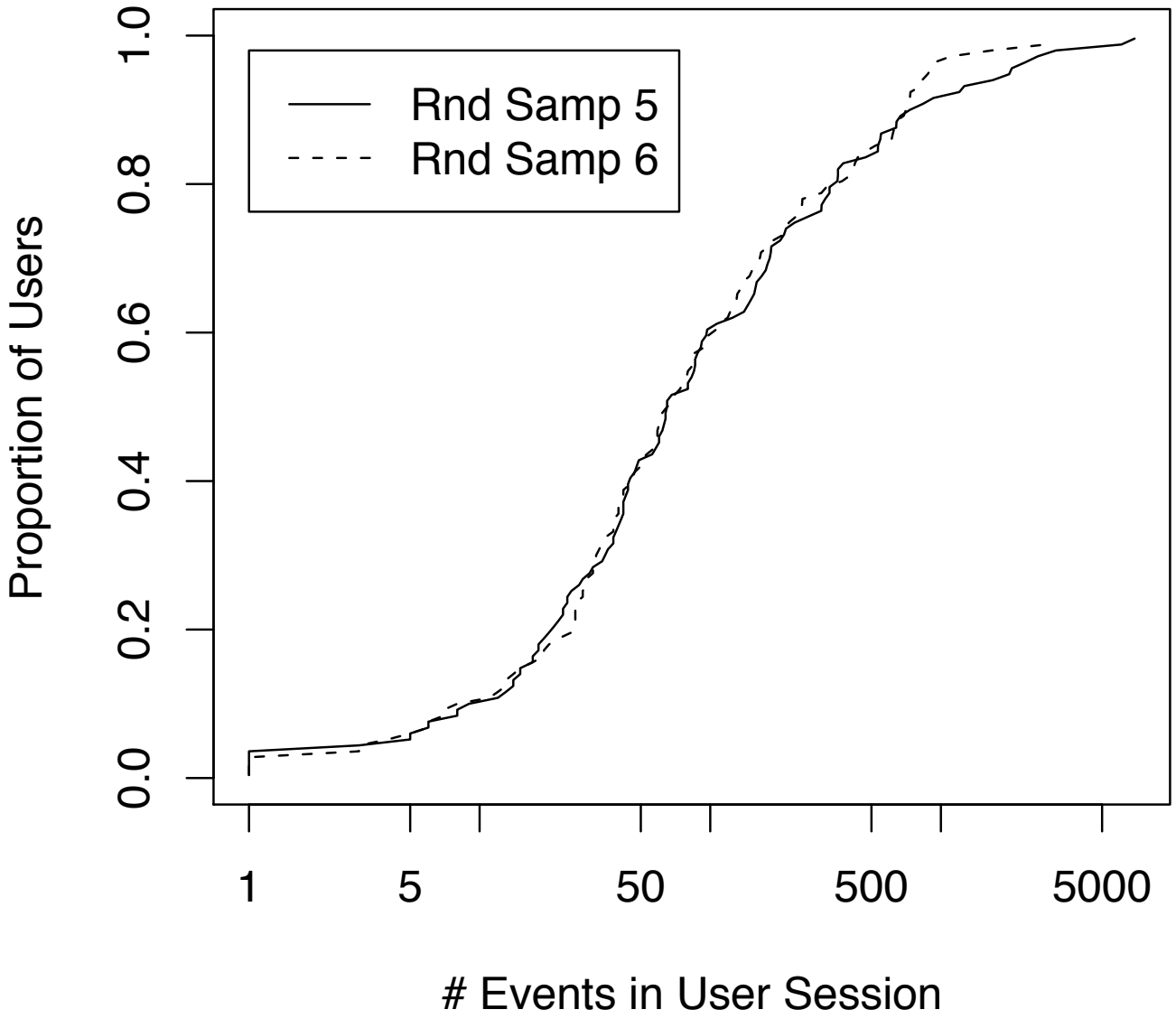

Rnd Samp 1
Rnd Samp 2
Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1
5
50
500
5000
Events in User Session

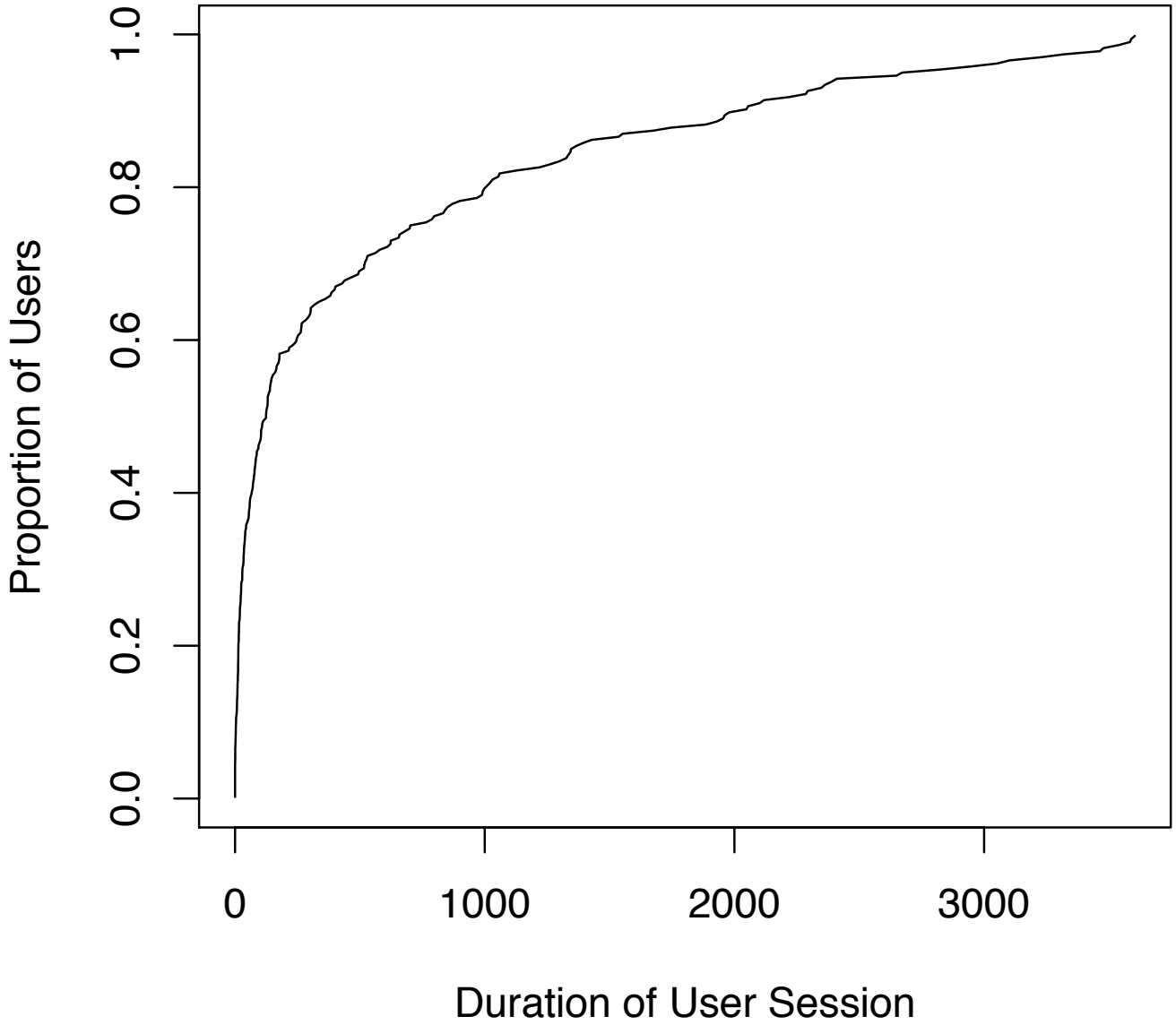
```
> s1 <- sample(1:250, 125)
> cdf(session.events[s1],xlab="# Events in User Session", ylab="Proportion
of Users")
> cdf(session.events[-s1],add=T, lty=2)
```

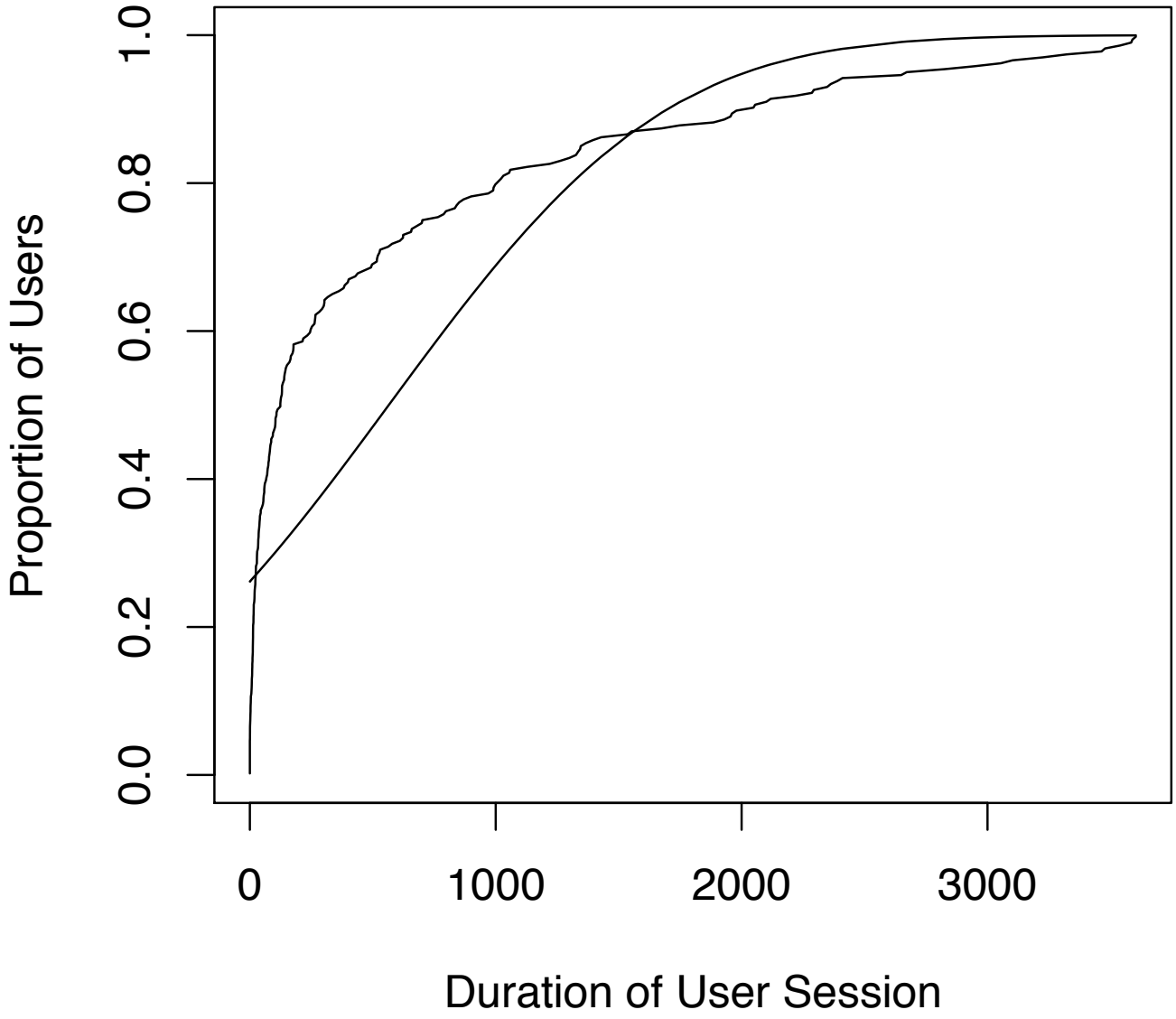


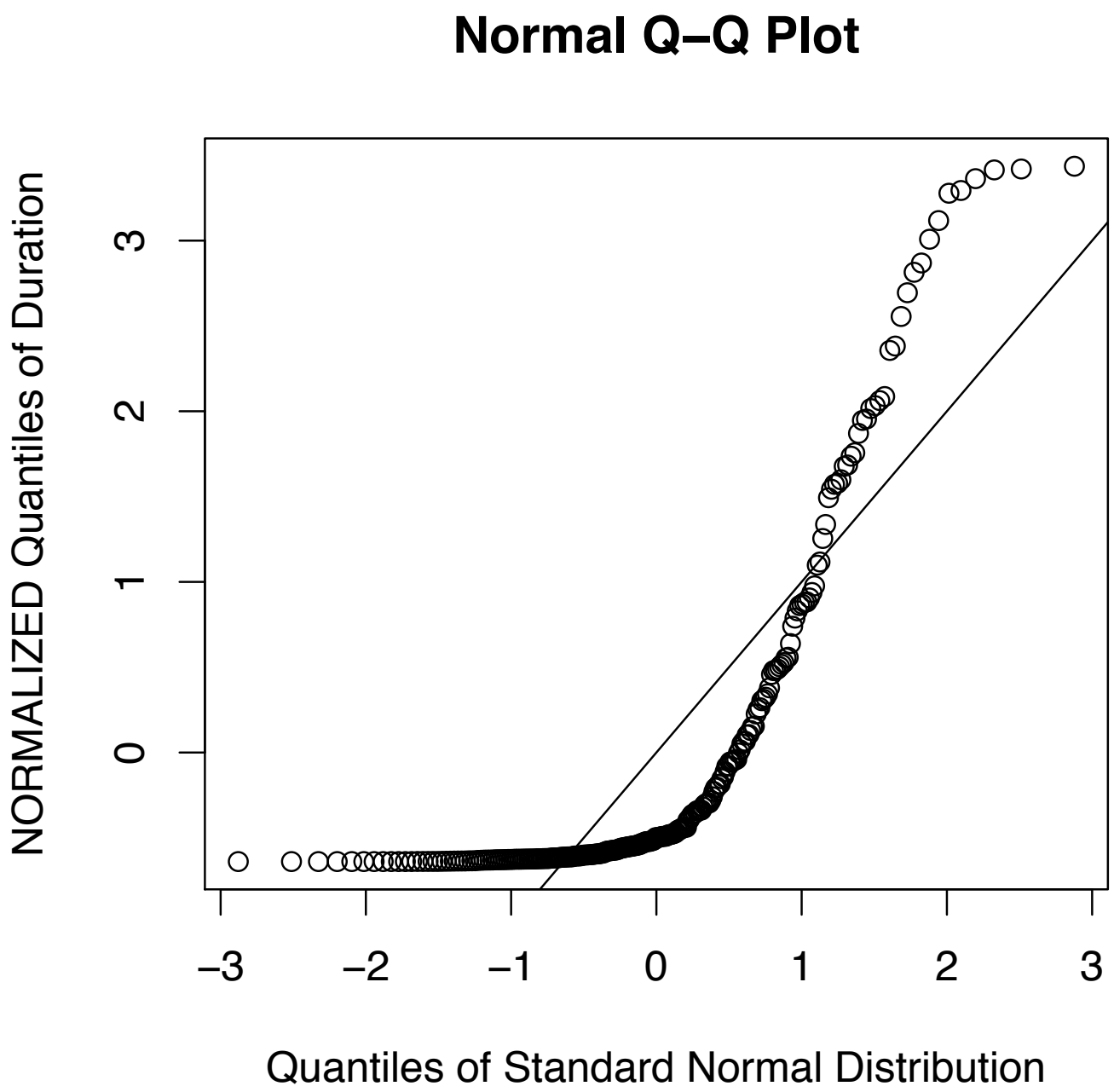

```
cdf <- function (array, add=F, type='l', ...)
{
    x <- sort(array)
    y <- ppoints(array)
    if (add)
        lines(x, y, type = type, ...)
    else
        plot(x, y, type = type, ...)
}
```

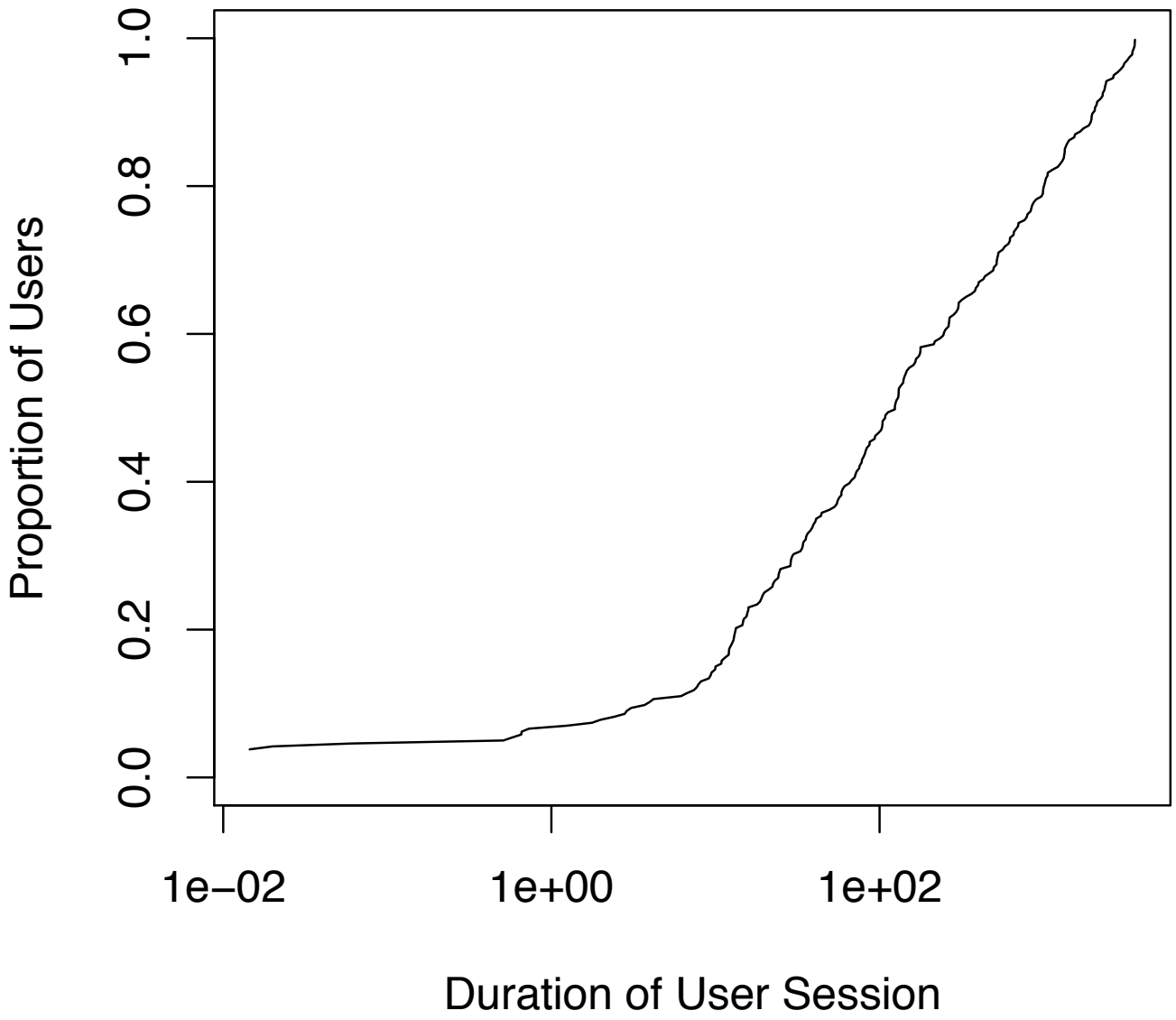

Rnd Samp 3
Rnd Samp 4
Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1
5
50
500
5000
Events in User Session

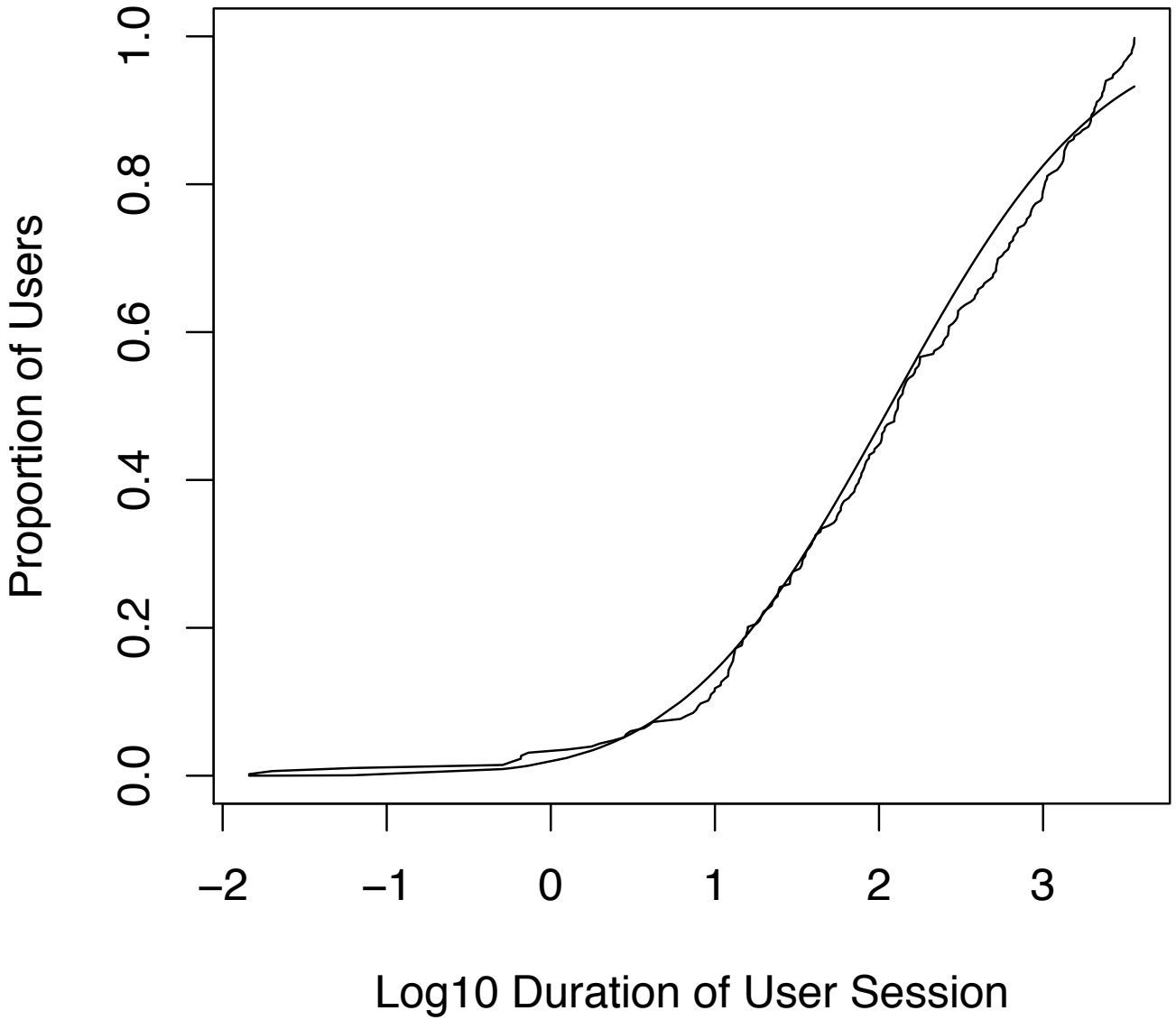

Rnd Samp 5
Rnd Samp 6
Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1
5
50
500
5000
Events in User Session

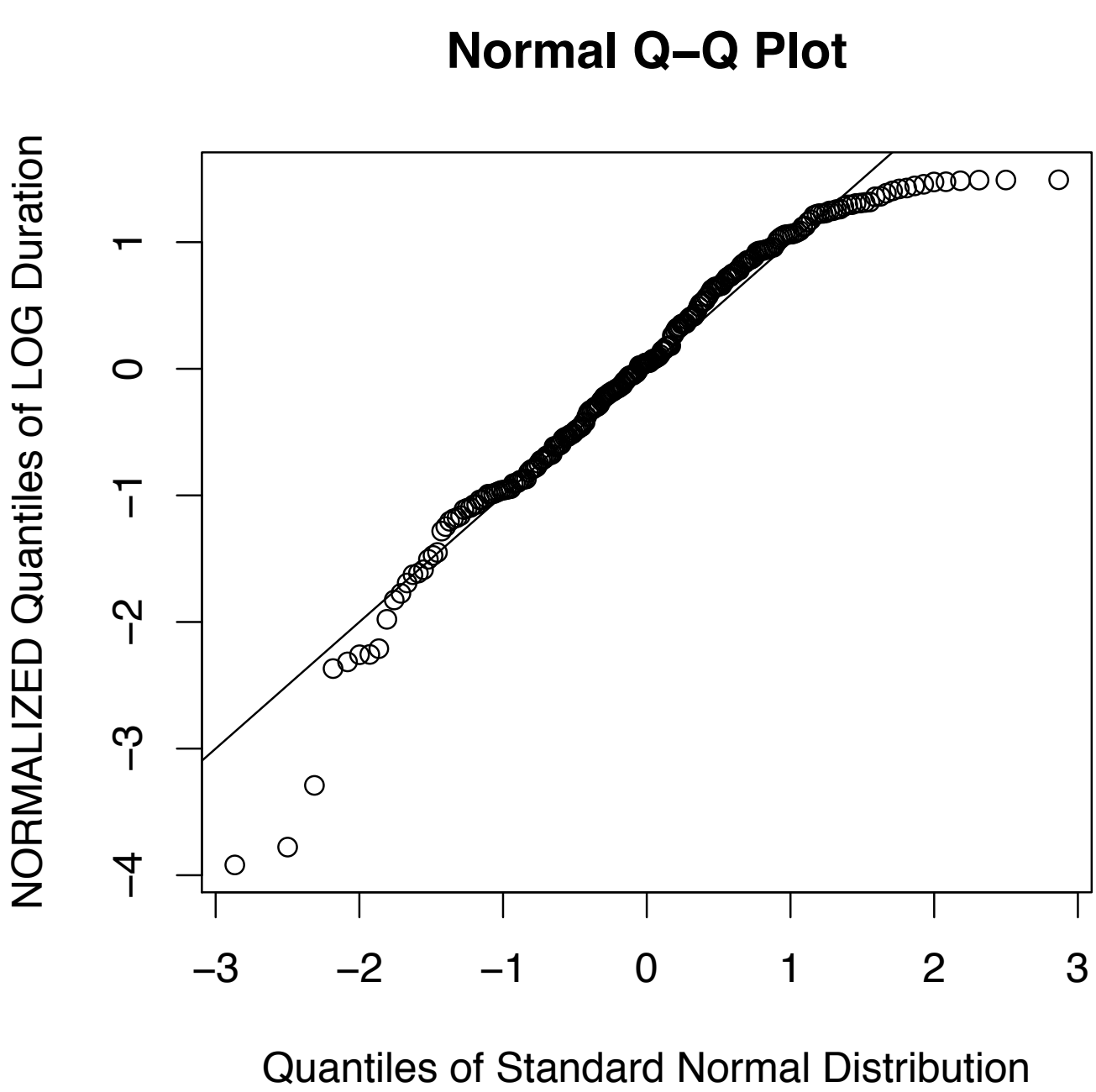

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
0
1000
2000
3000
Duration of User Session

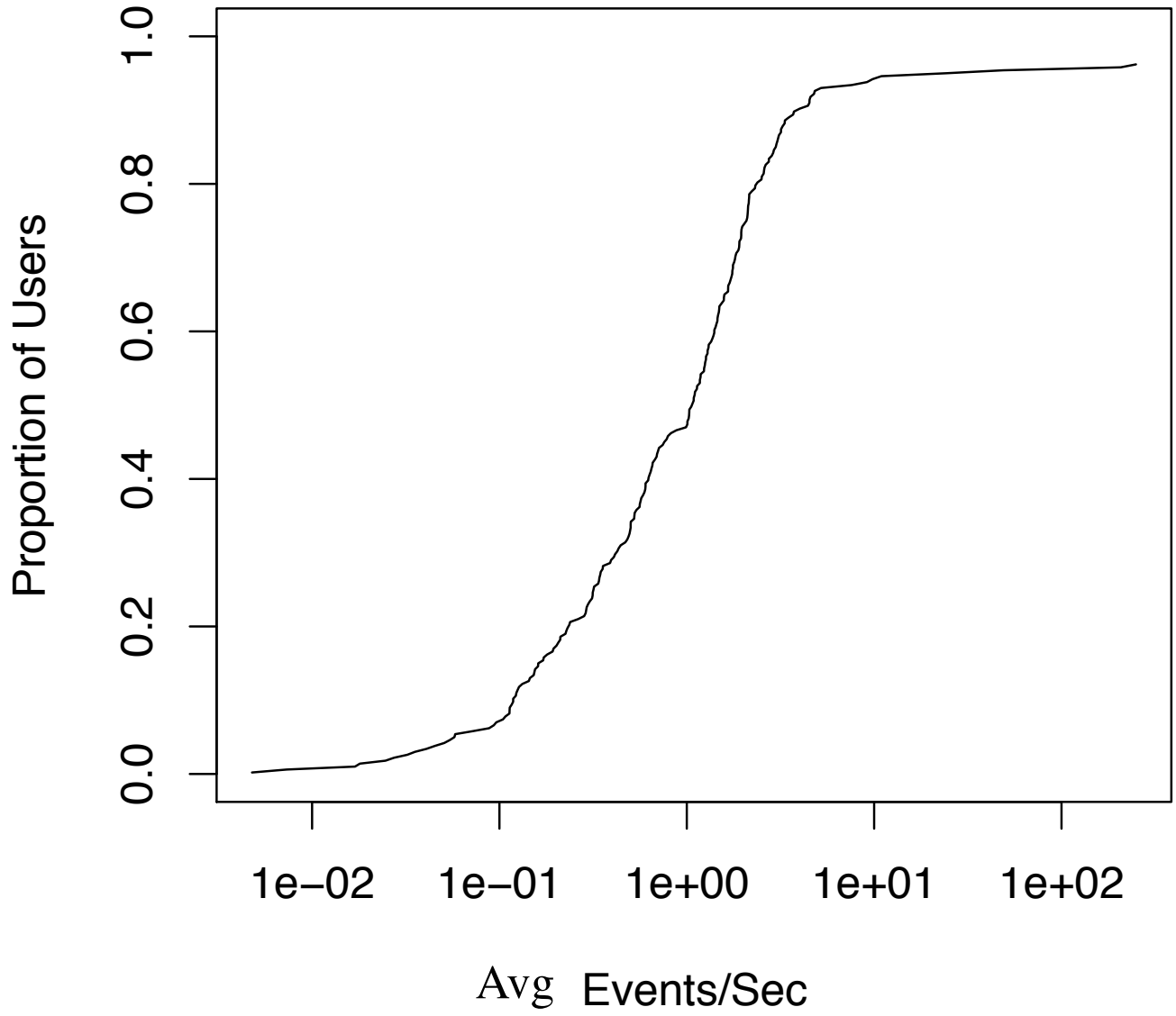

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
0
1000
2000
3000
Duration of User Session

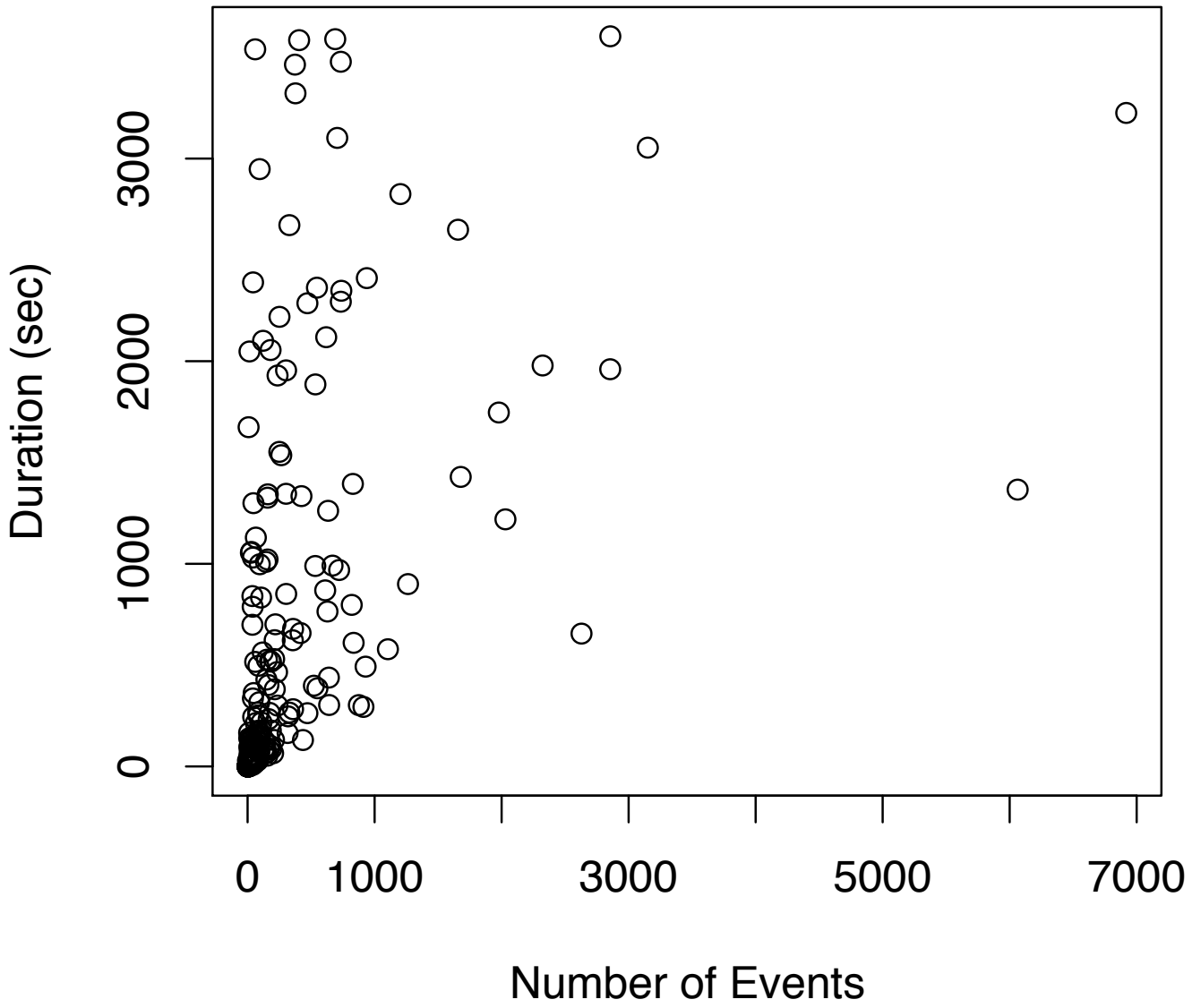

Normal Q–Q Plot
NORMALIZED Quantiles of Duration
0
1
2
3
–3
–2
–1
0
1
2
3
Quantiles of Standard Normal Distribution

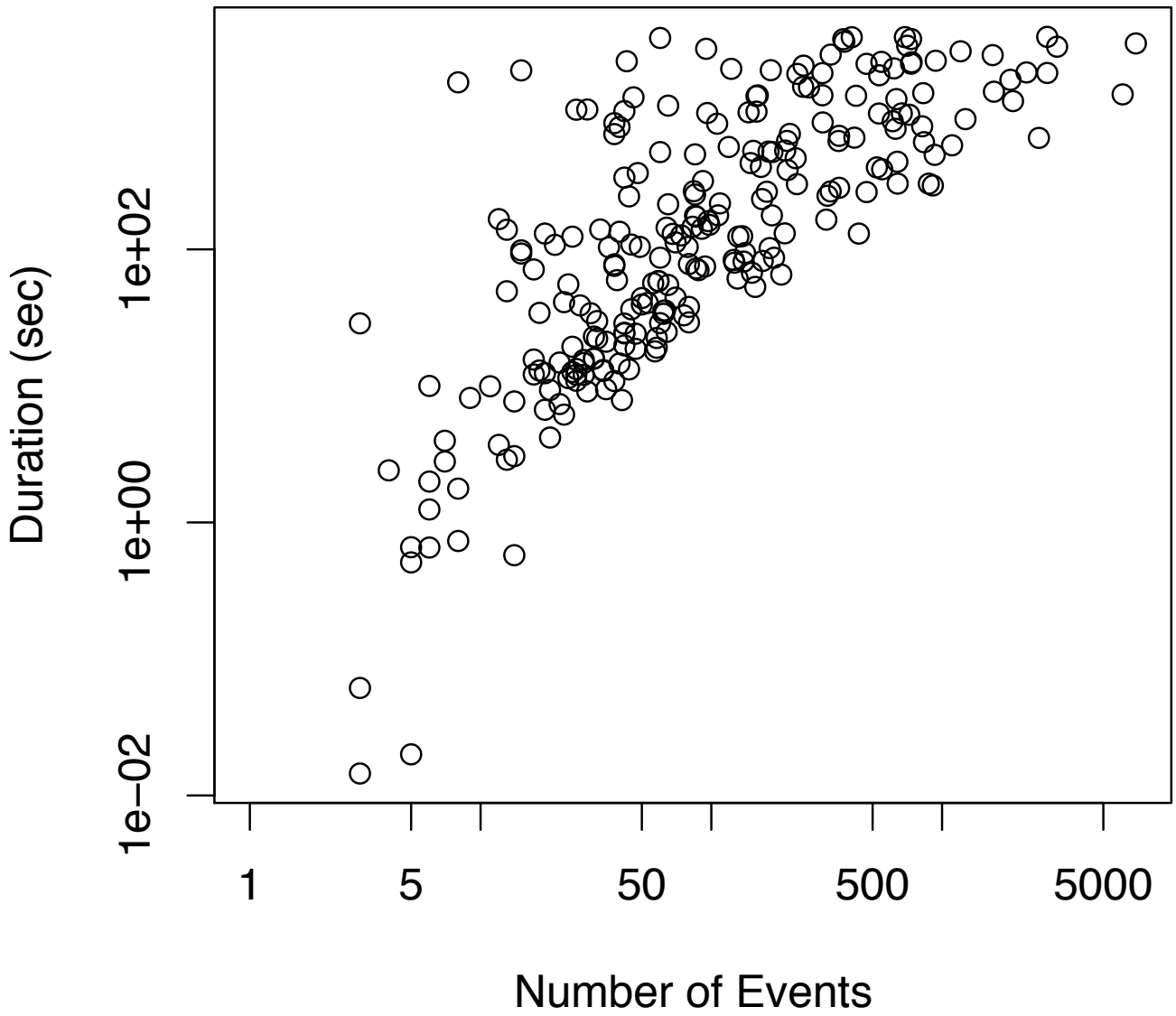

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1e−02
1e+00
1e+02
Duration of User Session

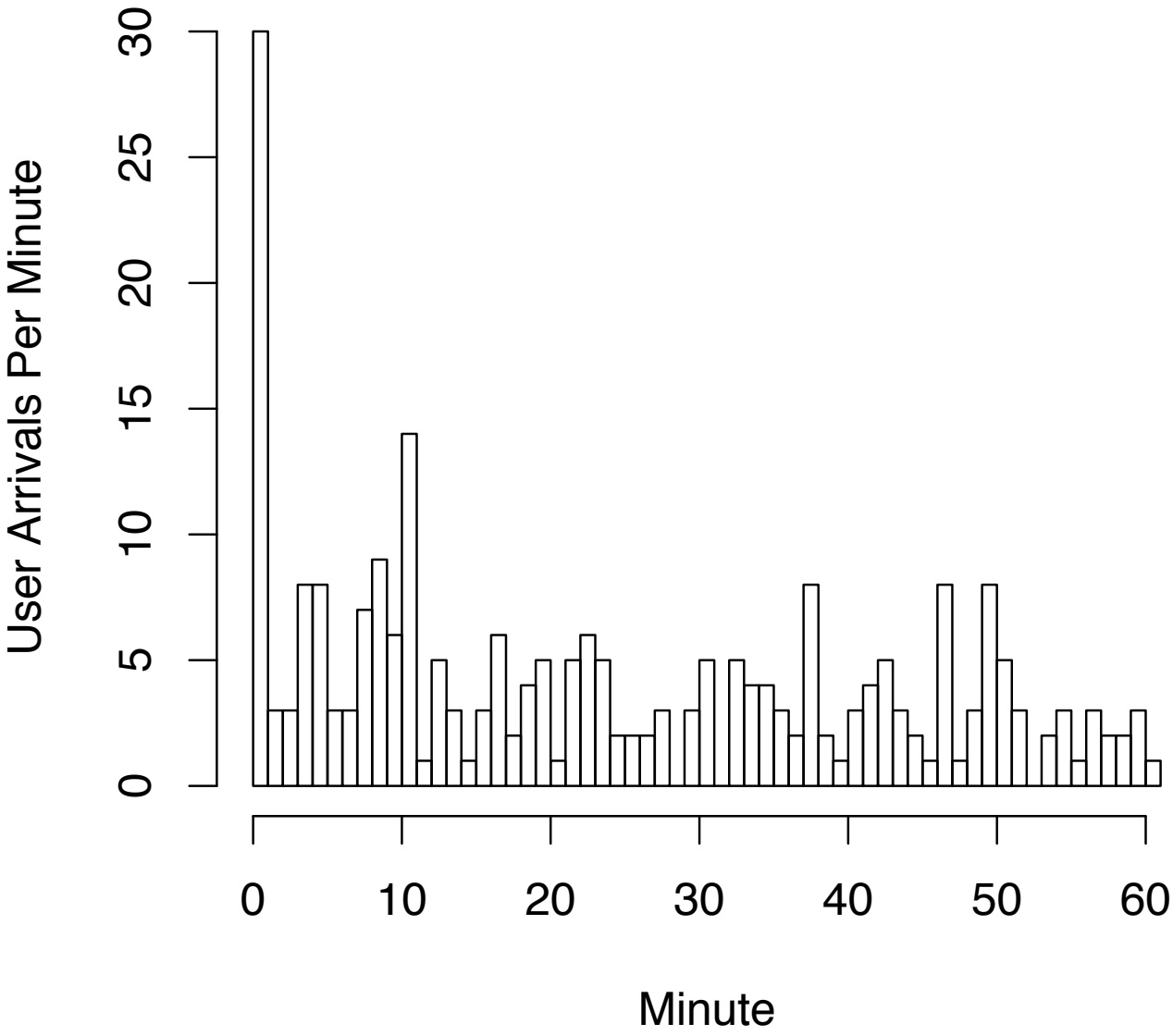

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
−2
−1
0
1
2
3
Log10 Duration of User Session

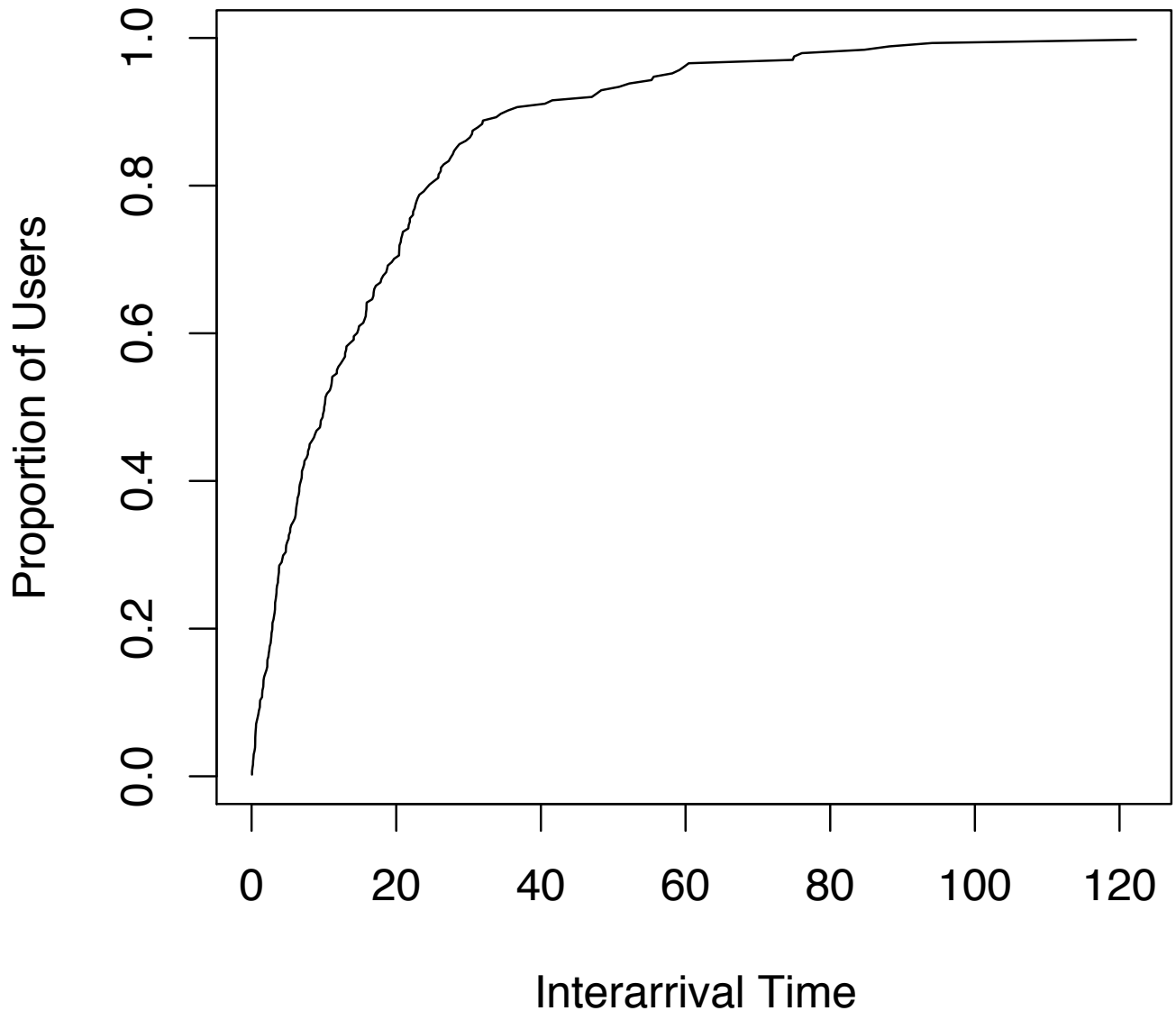

Normal Q–Q Plot
NORMALIZED Quantiles of LOG Duration
1
0
−1
−2
−3
−4
−3
−2
−1
0
1
2
3
Quantiles of Standard Normal Distribution

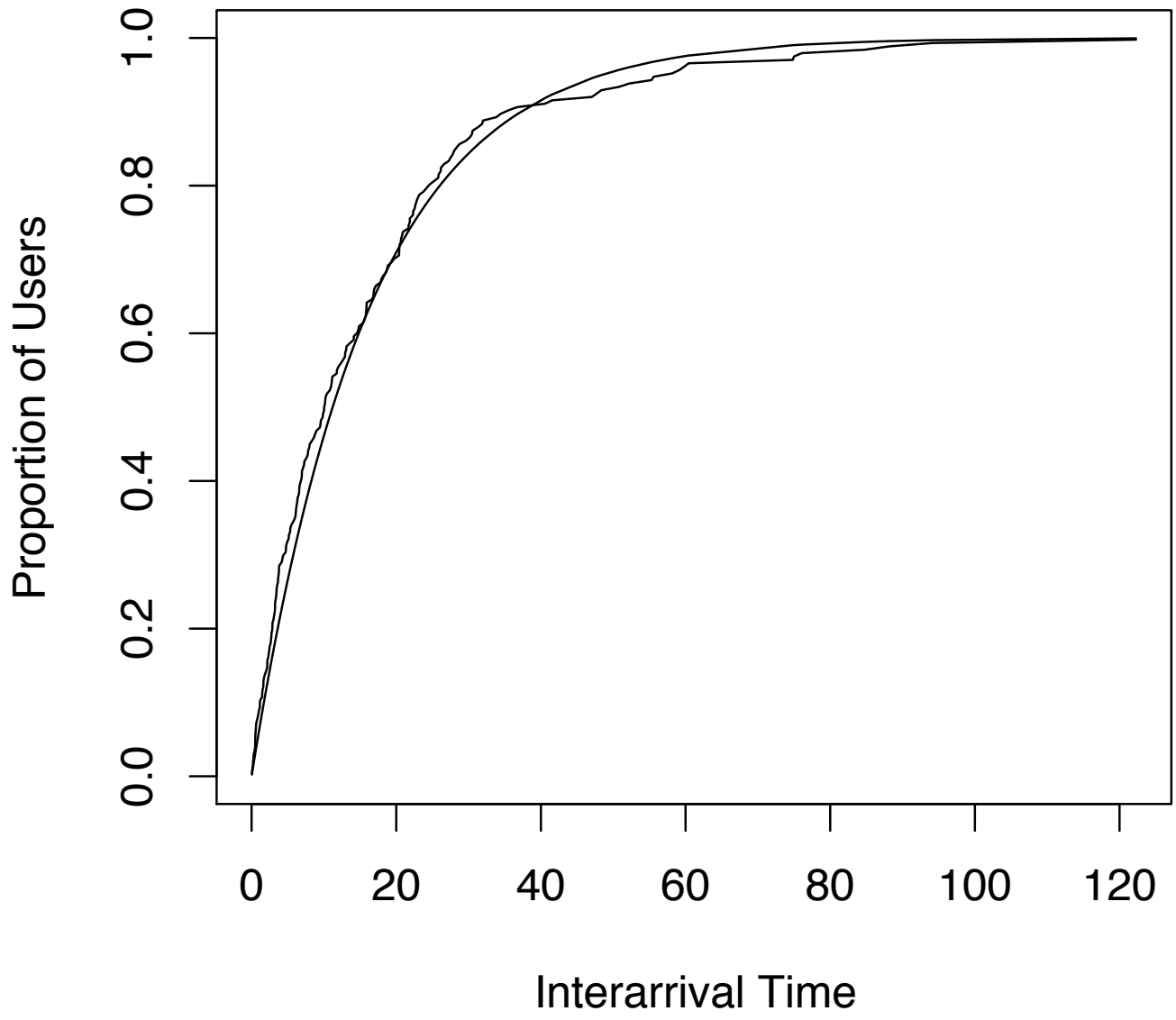

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
1e−02
1e−01
1e+00
1e+01
1e+02
Avg Events/Sec

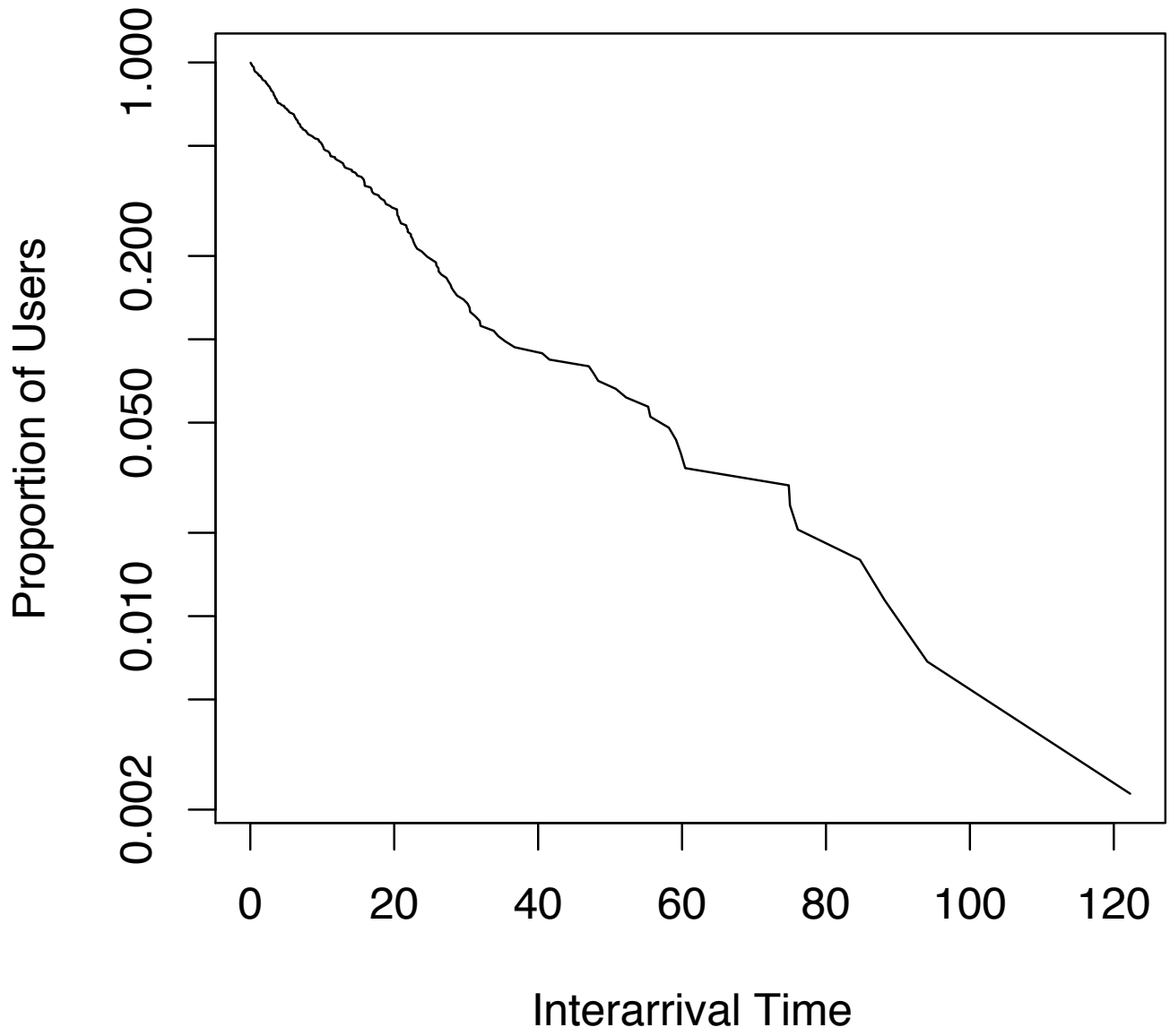

Duration (sec)
0
1000
2000
3000
0
1000
3000
5000
7000
Number of Events

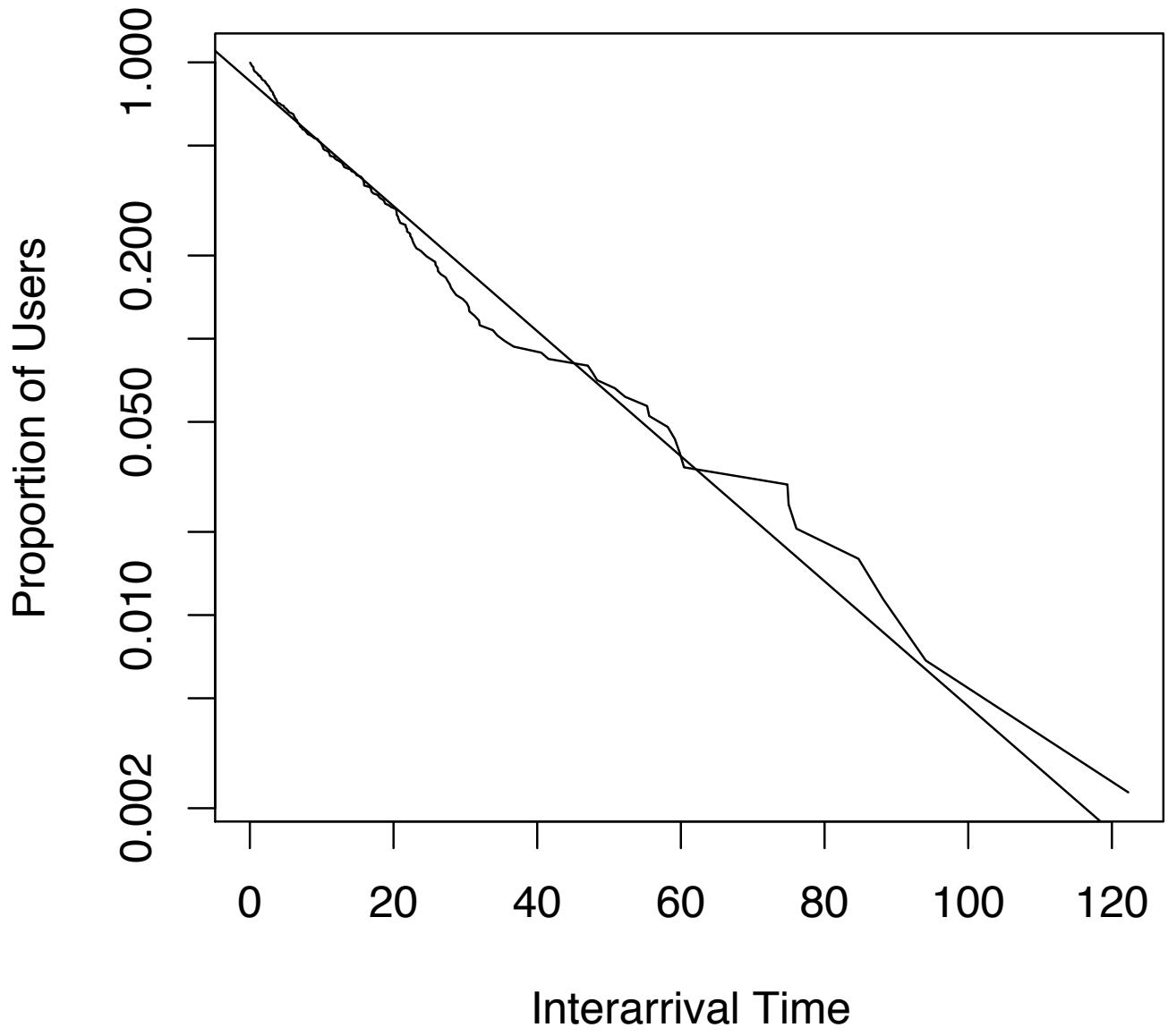

Duration (sec)
1e−02
1e+00
1e+02
1
5
50
500
5000
Number of Events

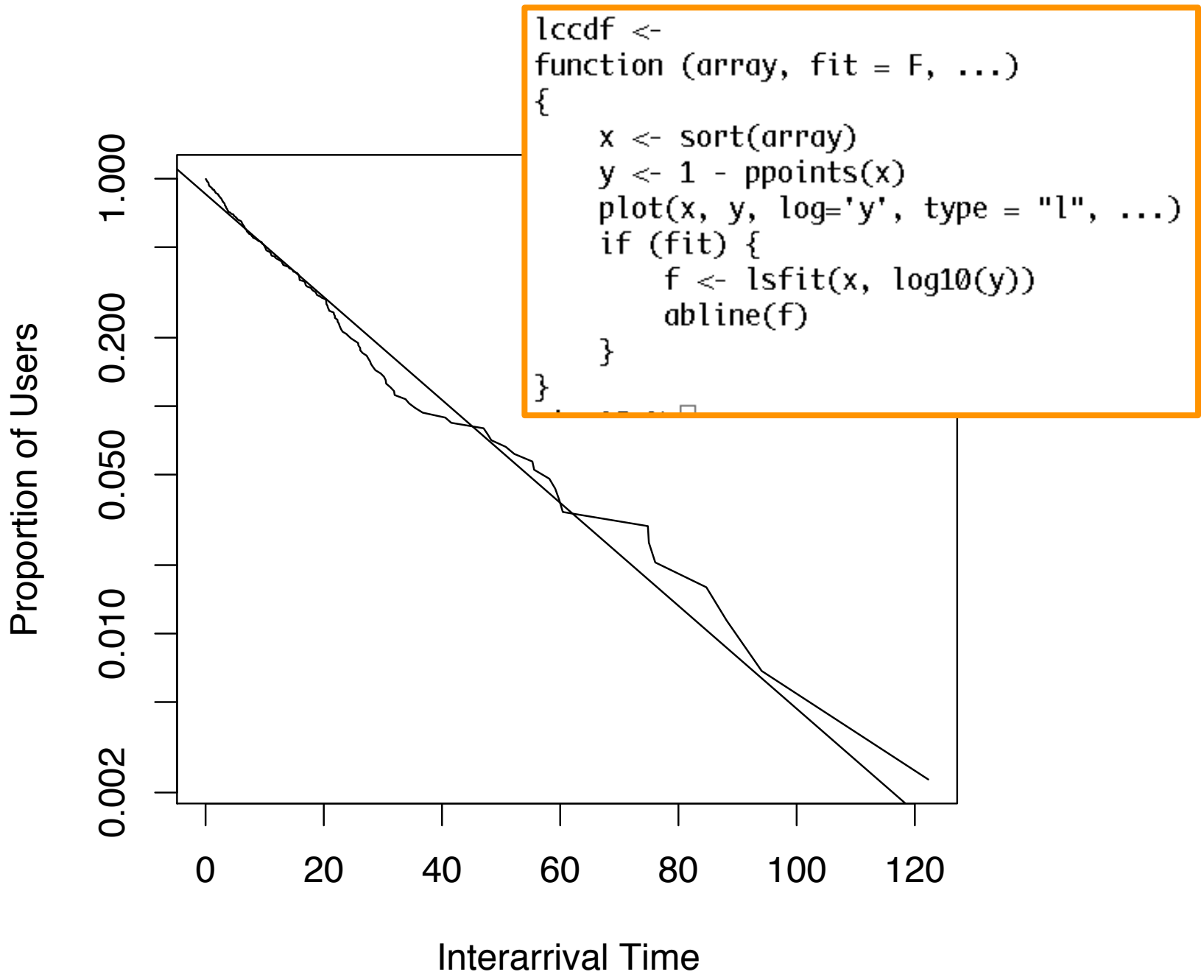

User Arrivals Per Minute
0
5
10
15
20
25
30
0
10
20
30
40
50
60
Minute

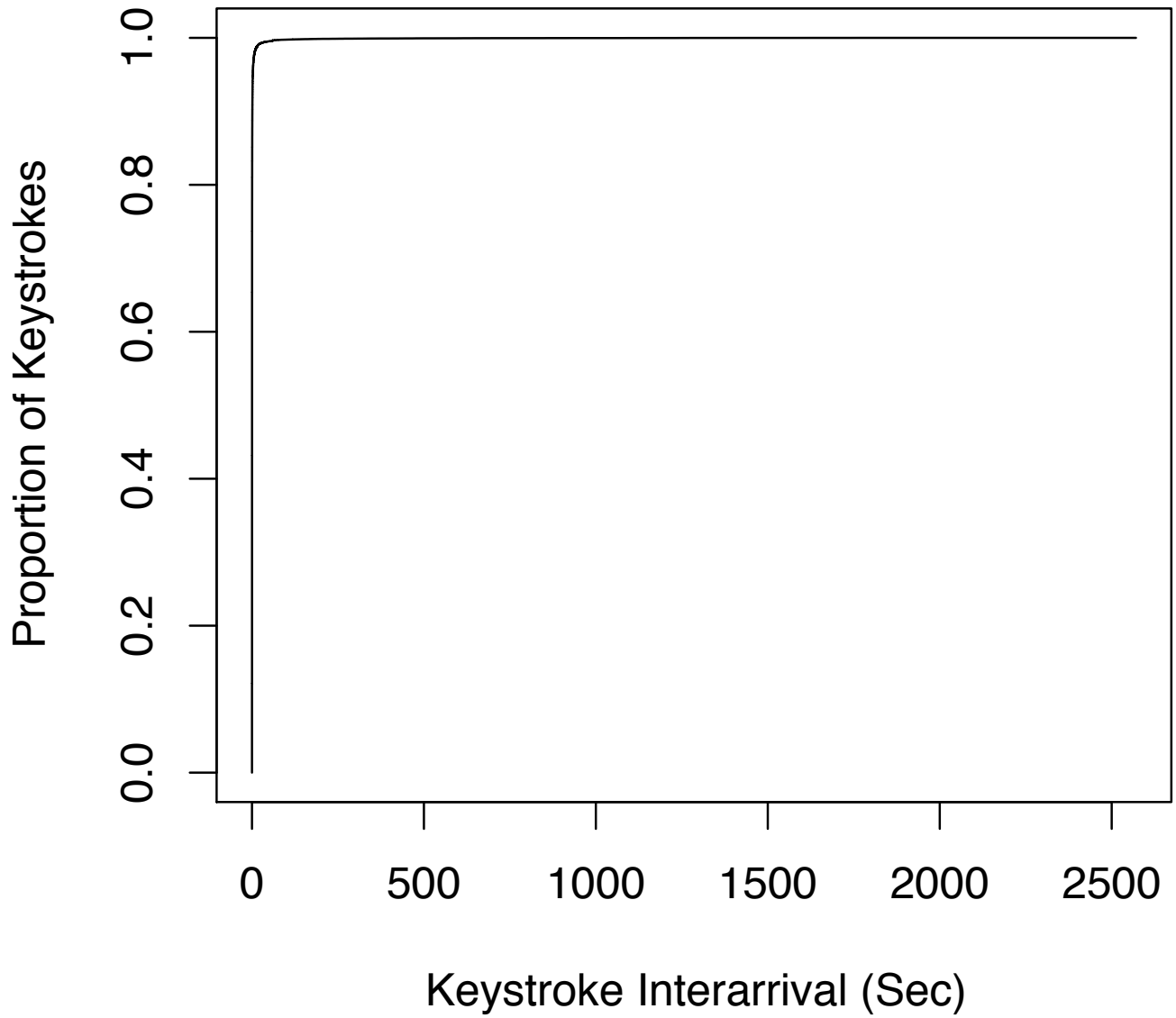

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
120
Interarrival Time

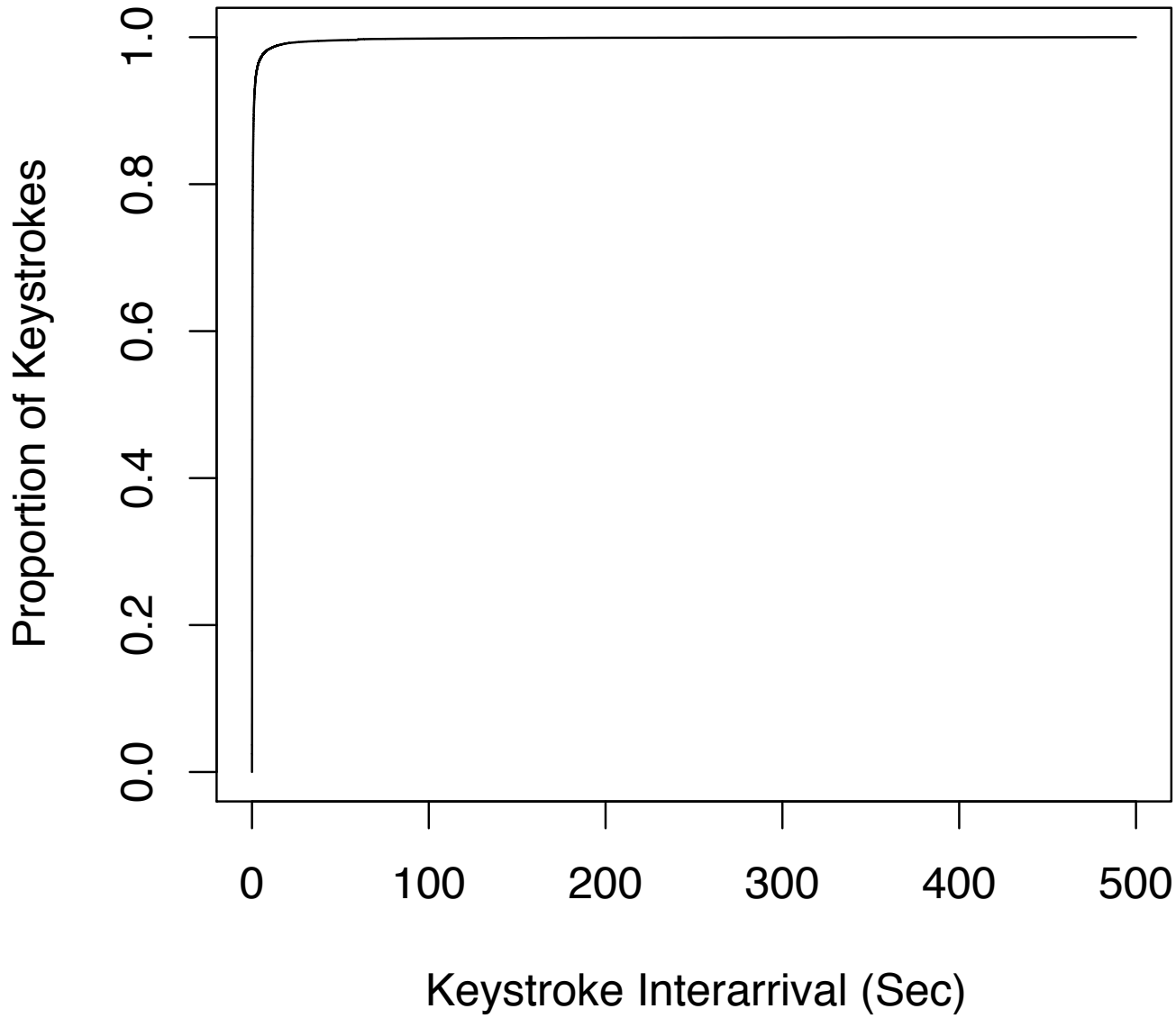

Proportion of Users
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
120
Interarrival Time

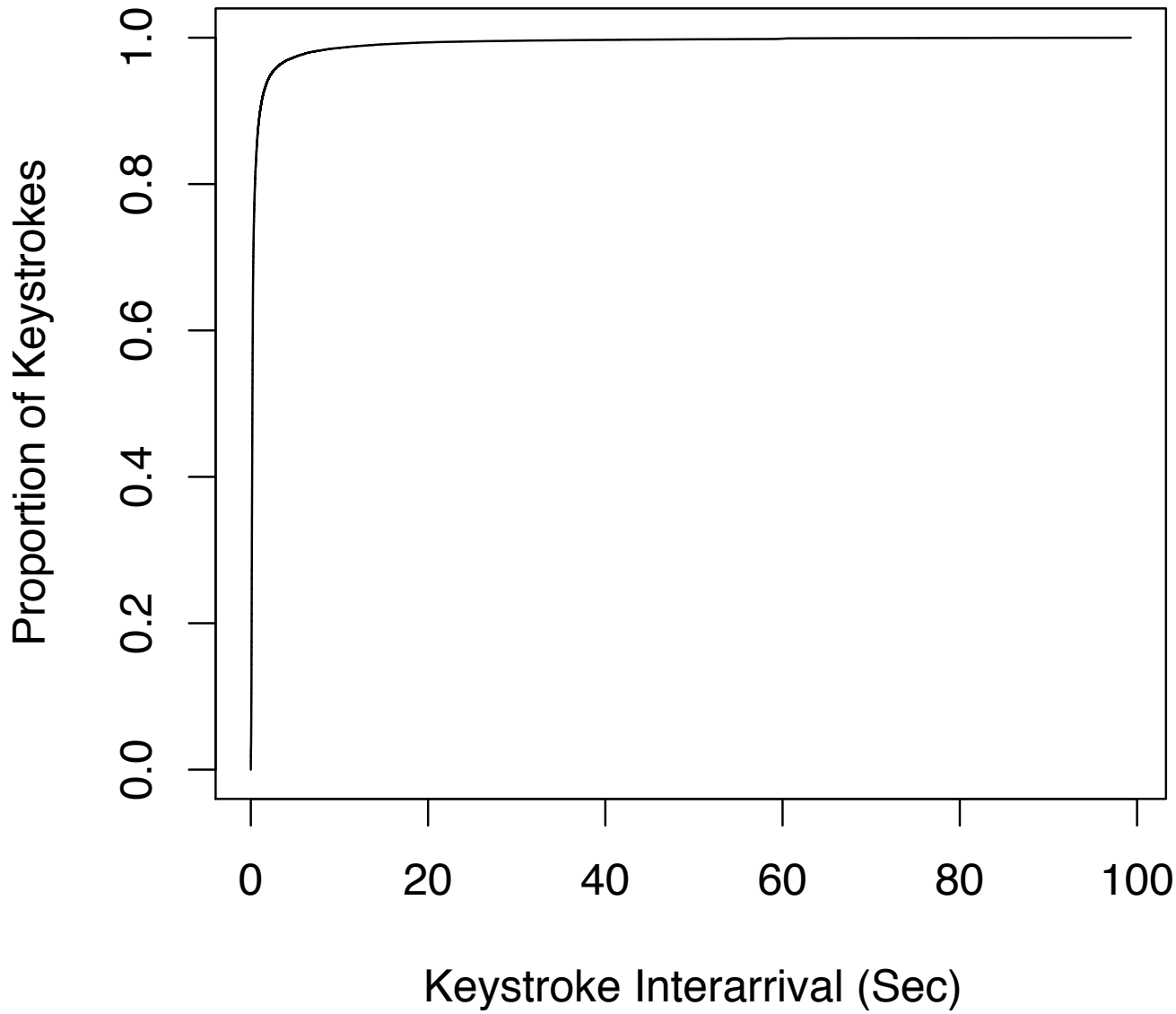

Proportion of Users
1.000
0.200
0.050
0.010
0.002
0
20
40
60
80
100
120
Interarrival Time

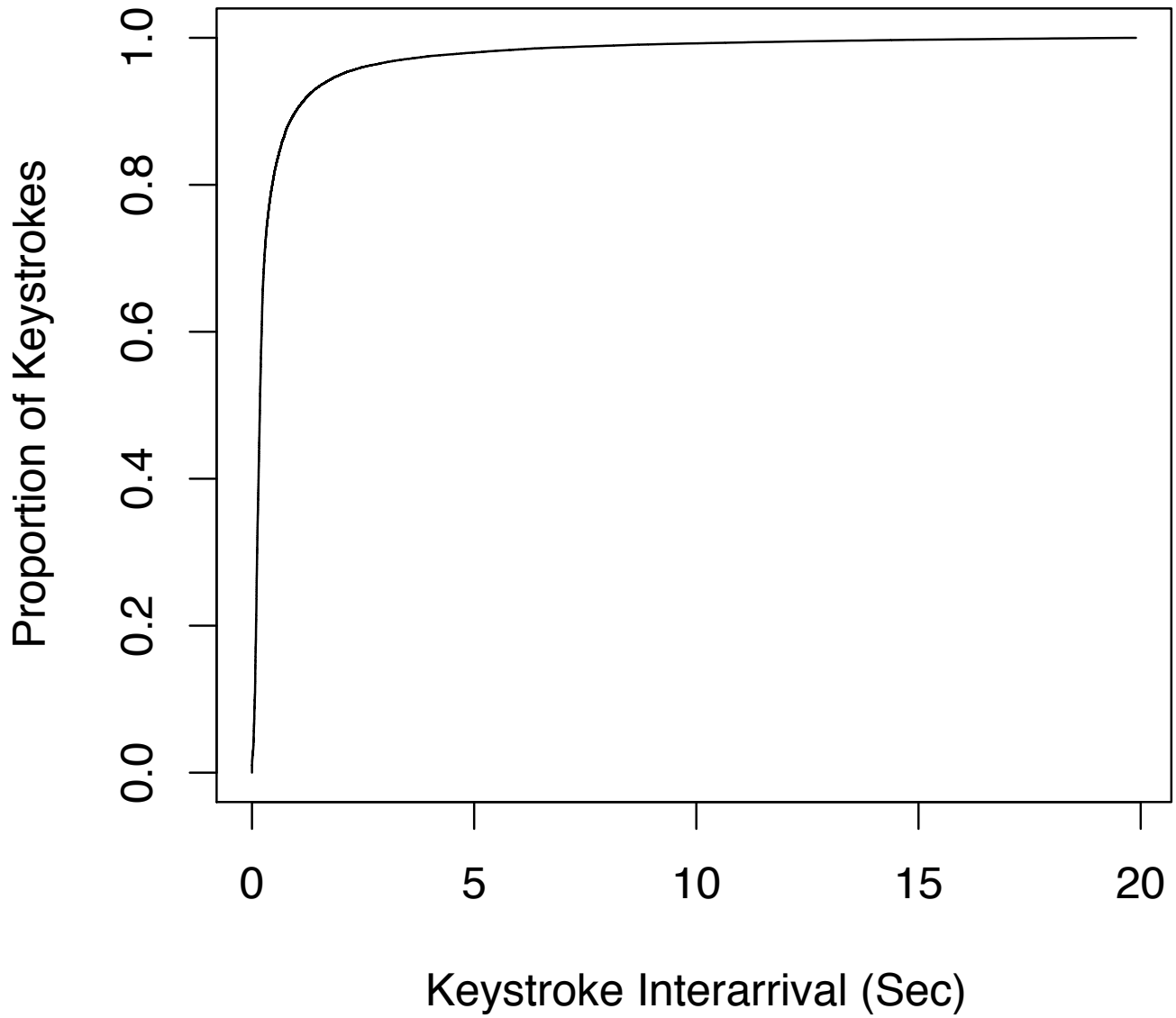

Proportion of Users
1.000
0.200
0.050
0.010
0.002
0
20
40
60
80
100
120
Interarrival Time

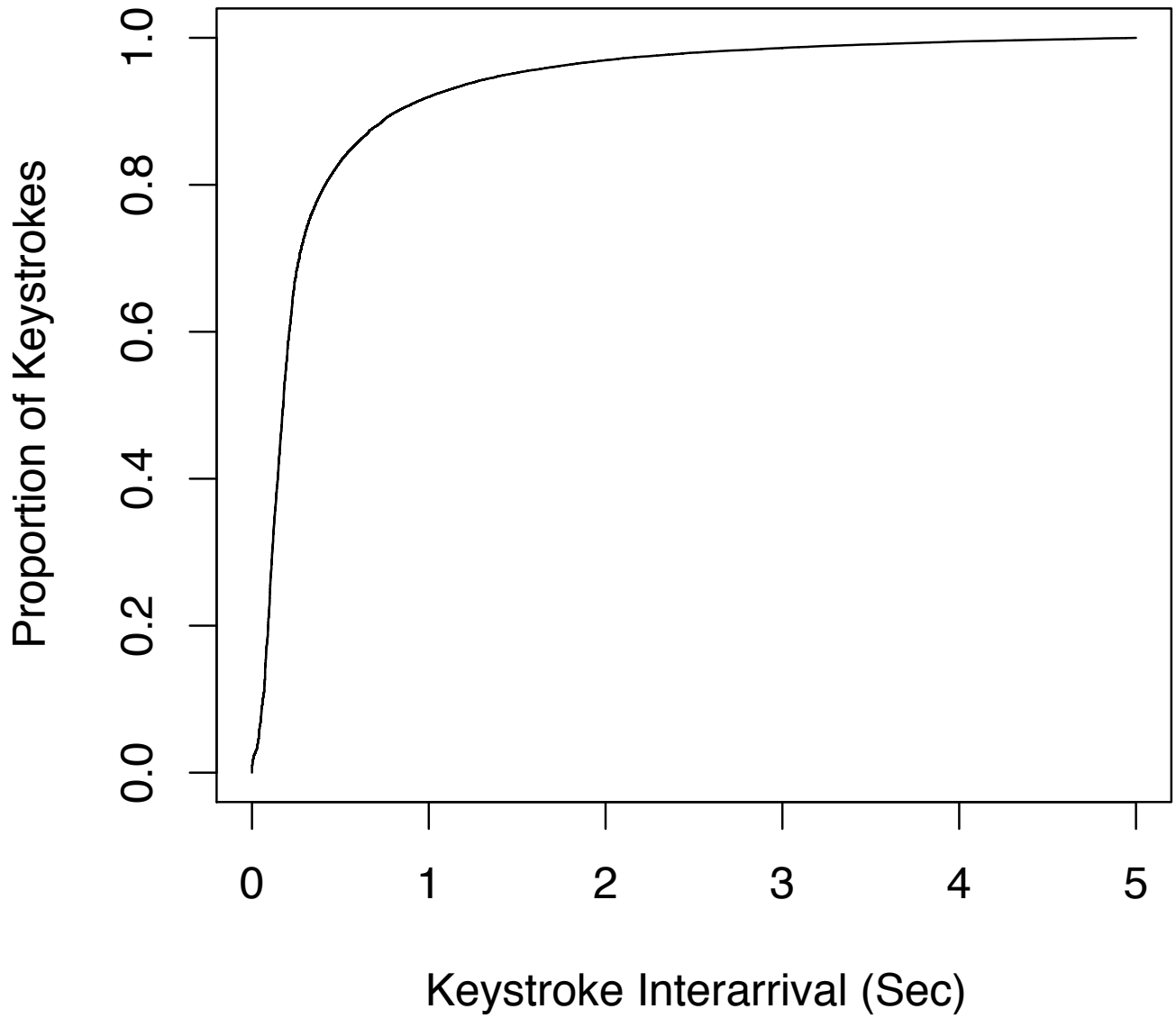

lccdf <-
function (array, fit = F, ...)
{
x <- sort(array)
y <- 1 - ppoints(x)
plot(x, y, log='y', type = "l", ...)
if (fit) {
f <- lsfit(x, log10(y))
abline(f)
}
}
Proportion of Users
1.000
0.200
0.050
0.010
0.002
0
20
40
60
80
100
120
Interarrival Time

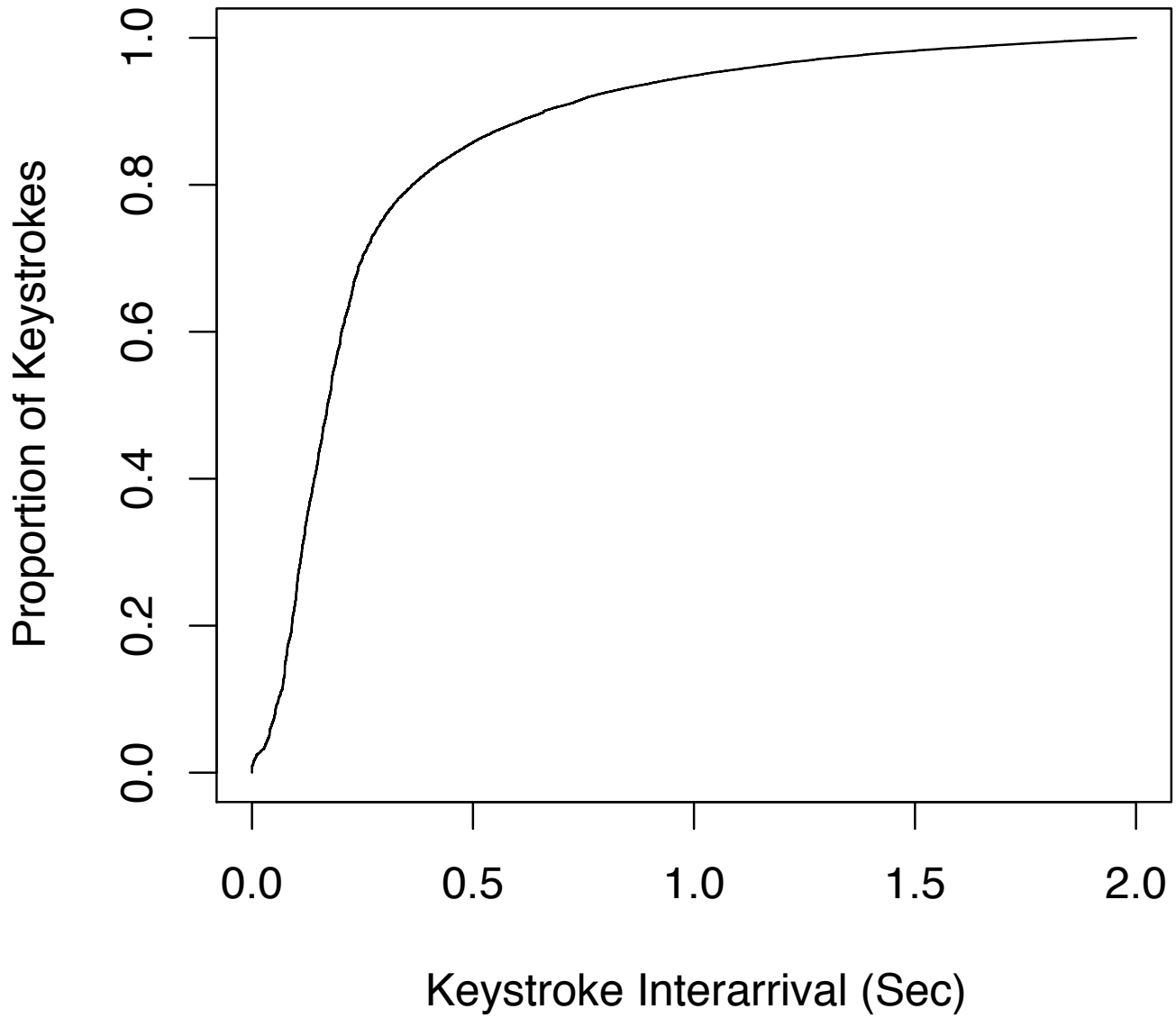

Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
0
500
1000
1500
2000
2500
Keystroke Interarrival (Sec)

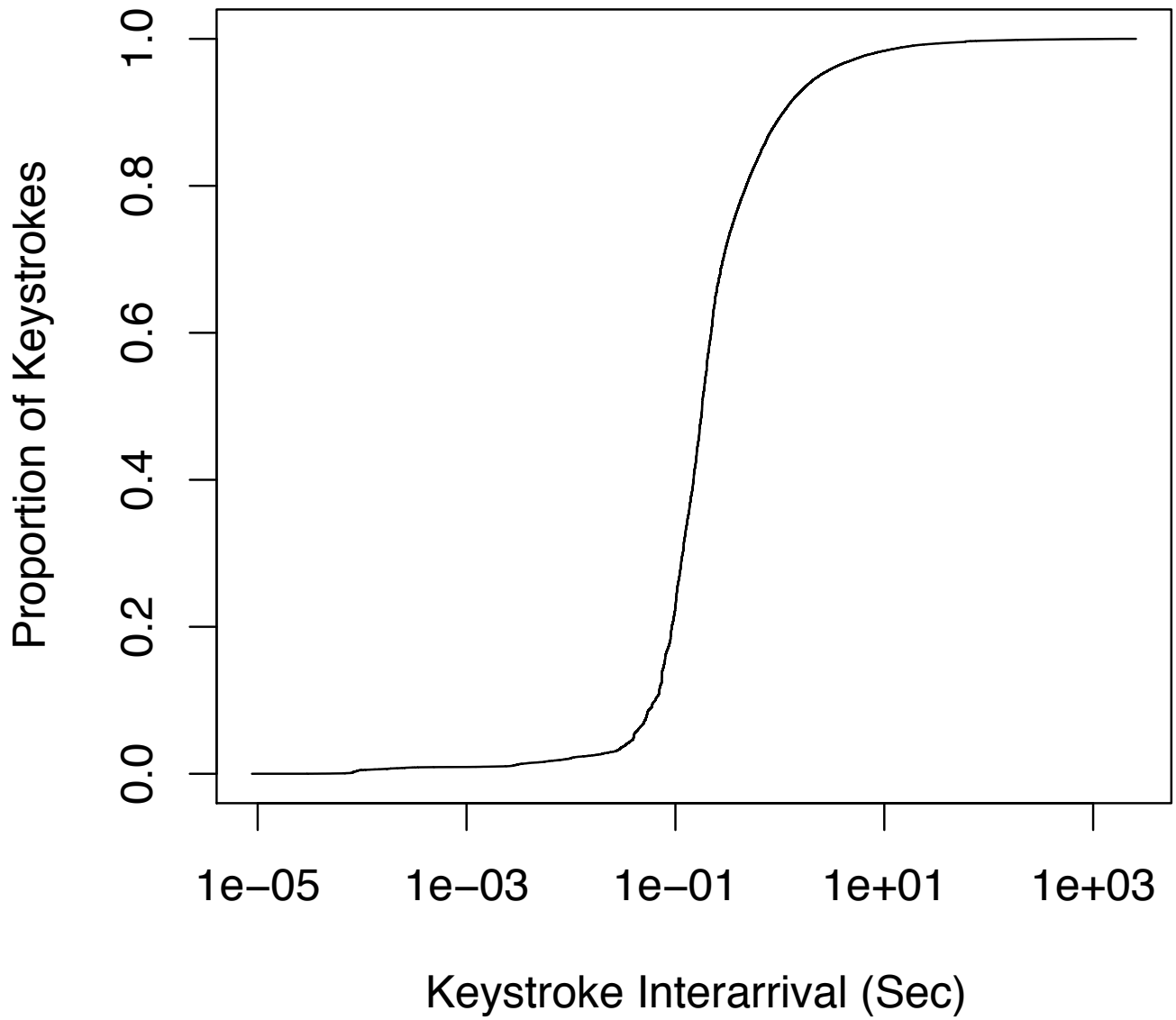

Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
0
100
200
300
400
500
Keystroke Interarrival (Sec)

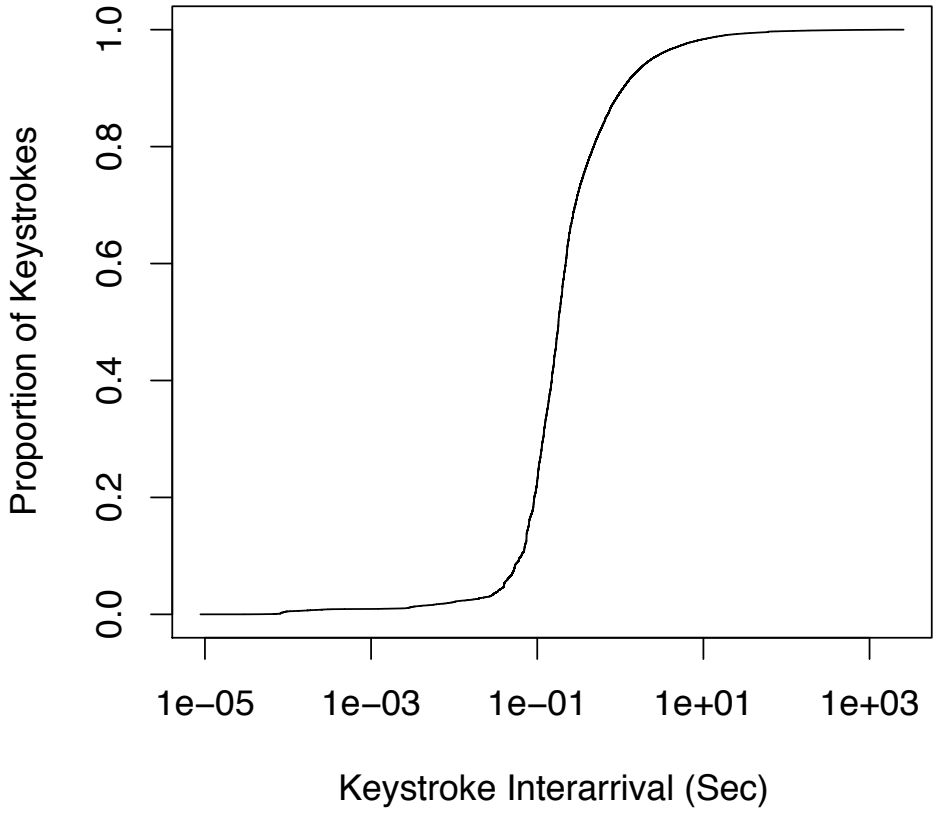

Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Keystroke Interarrival (Sec)


Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
Keystroke Interarrival (Sec)


Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
Keystroke Interarrival (Sec)


Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
Keystroke Interarrival (Sec)


Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
1e−05
1e−03
1e−01
1e+01
1e+03
Keystroke Interarrival (Sec)



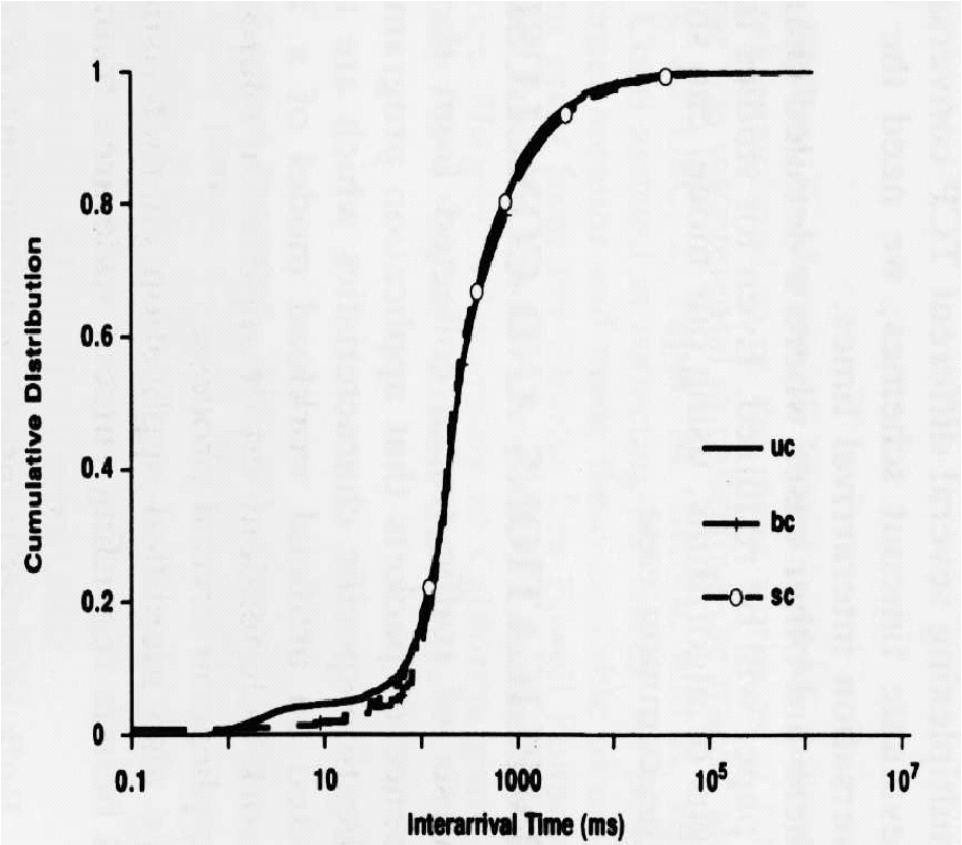


Figure 19. Distribution of TELNET packet interarrivals

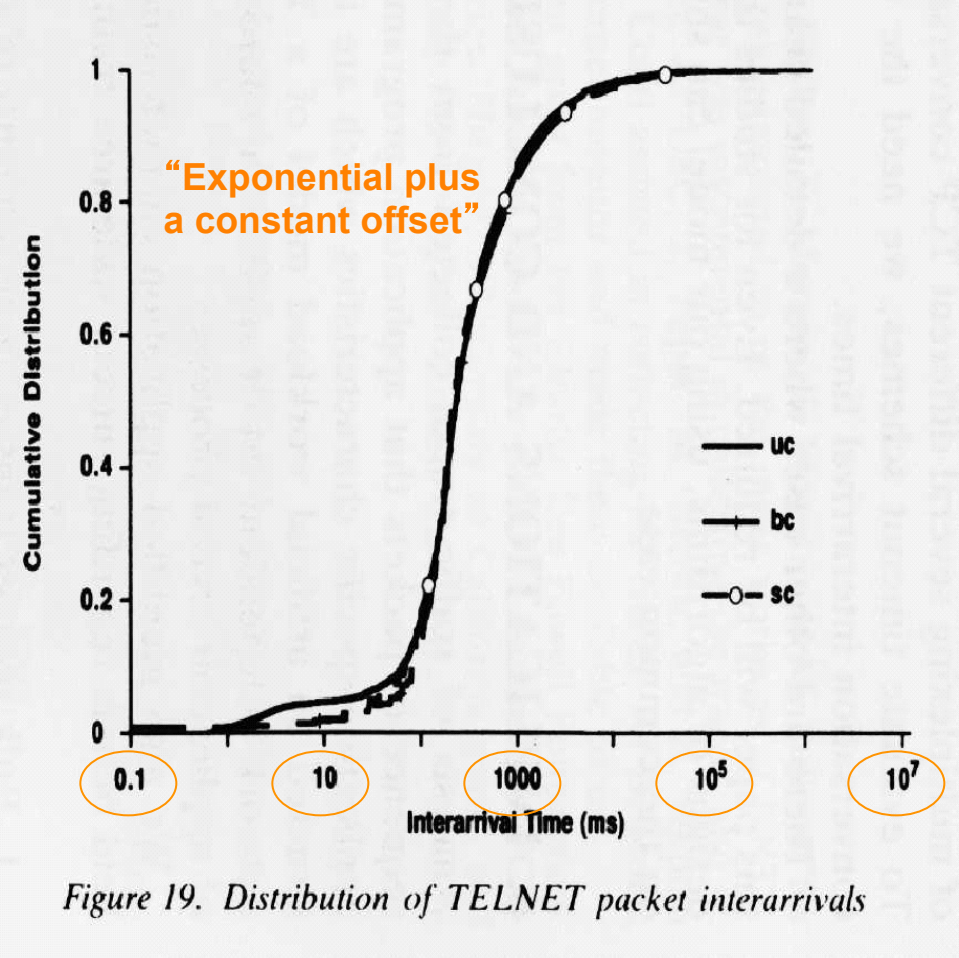
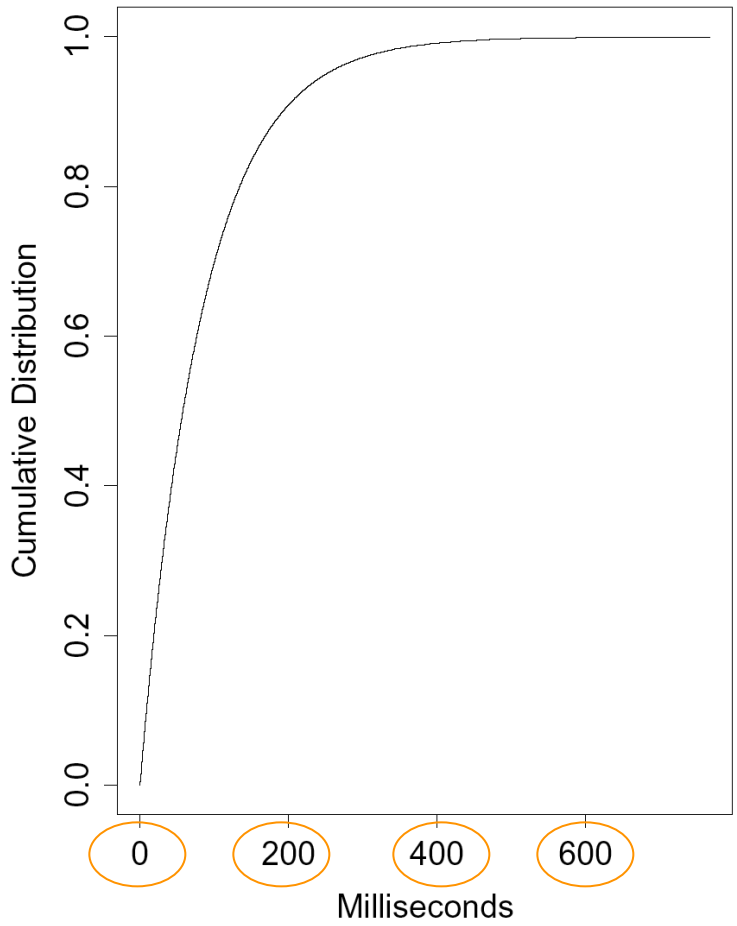
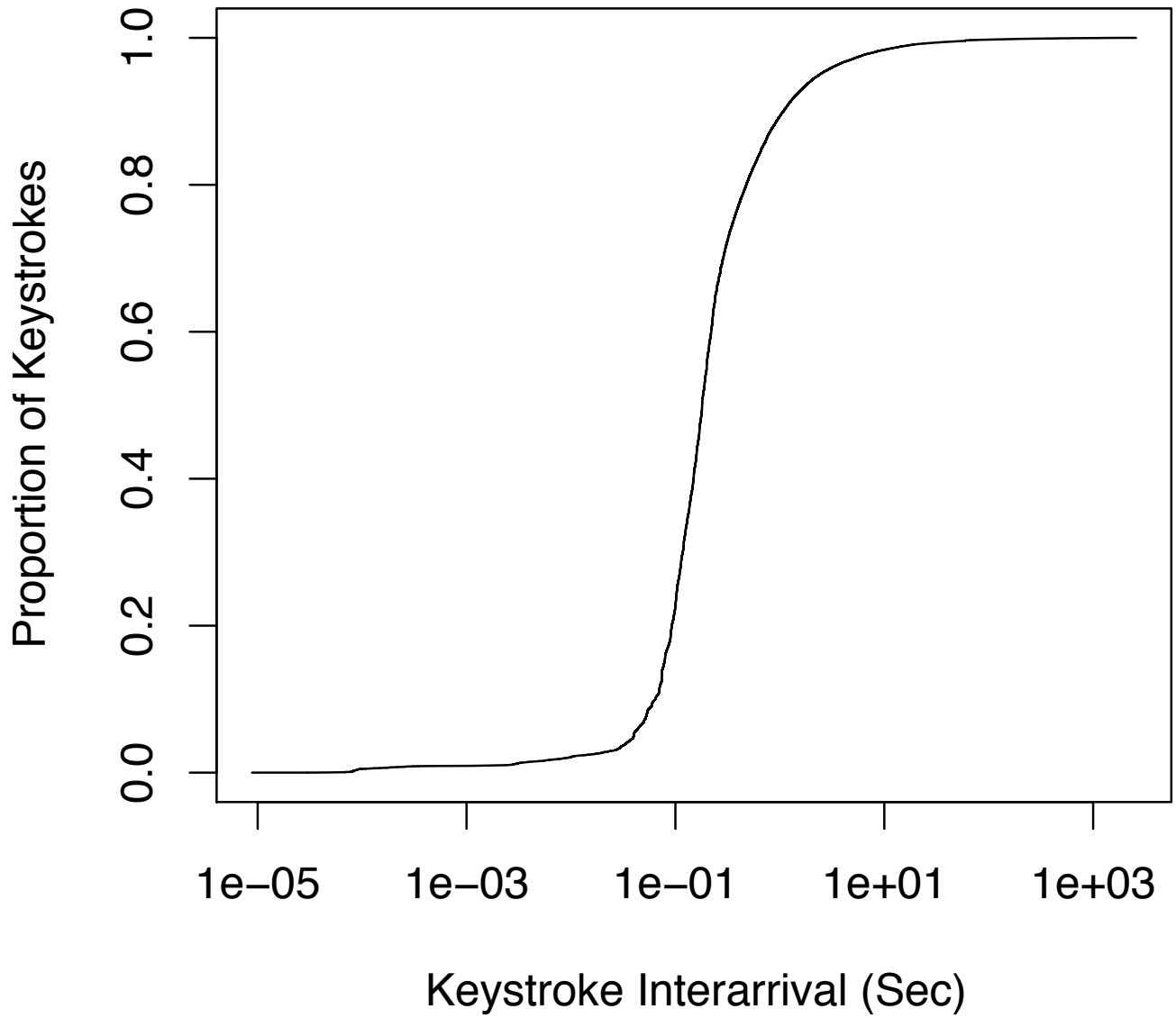
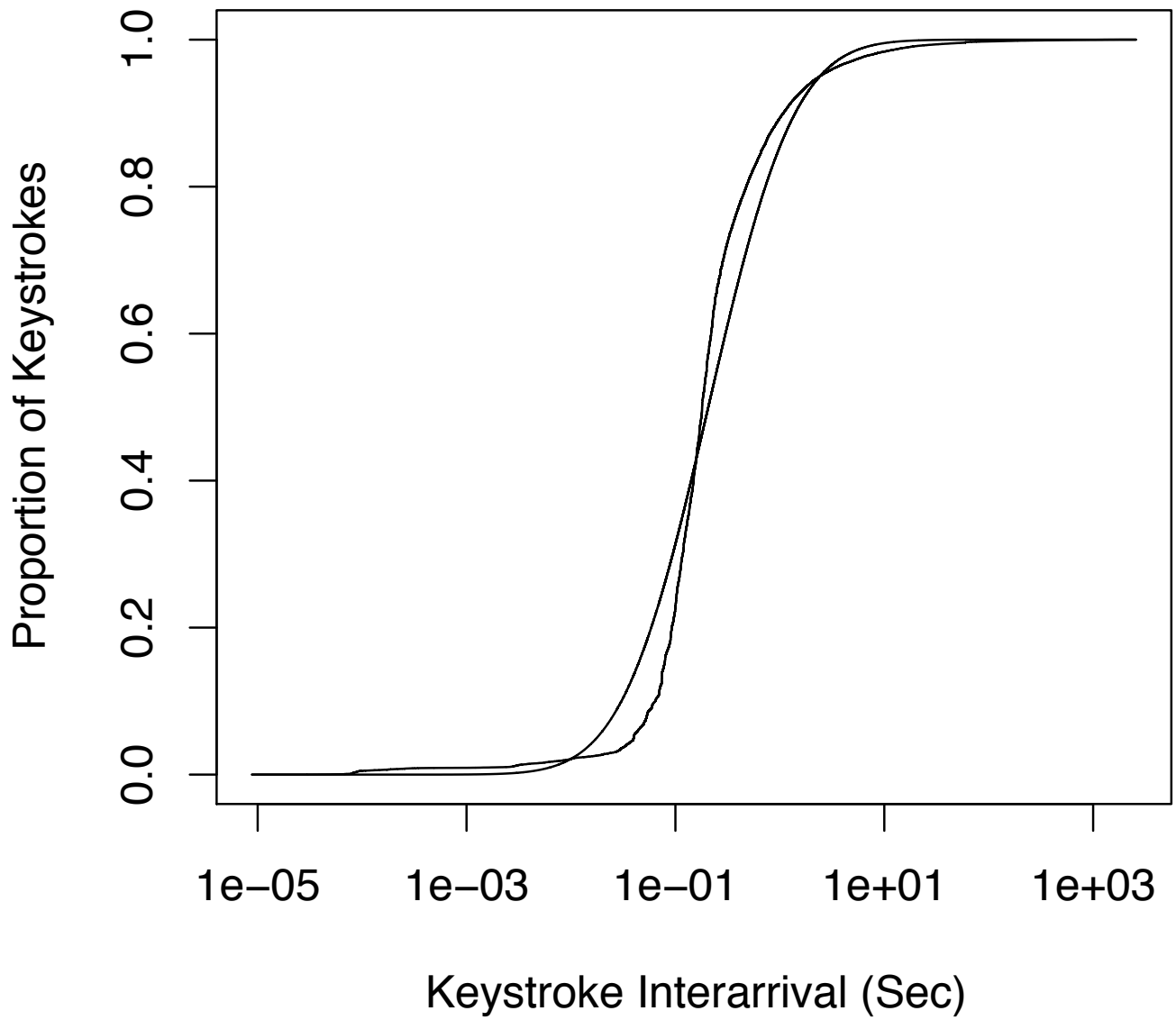


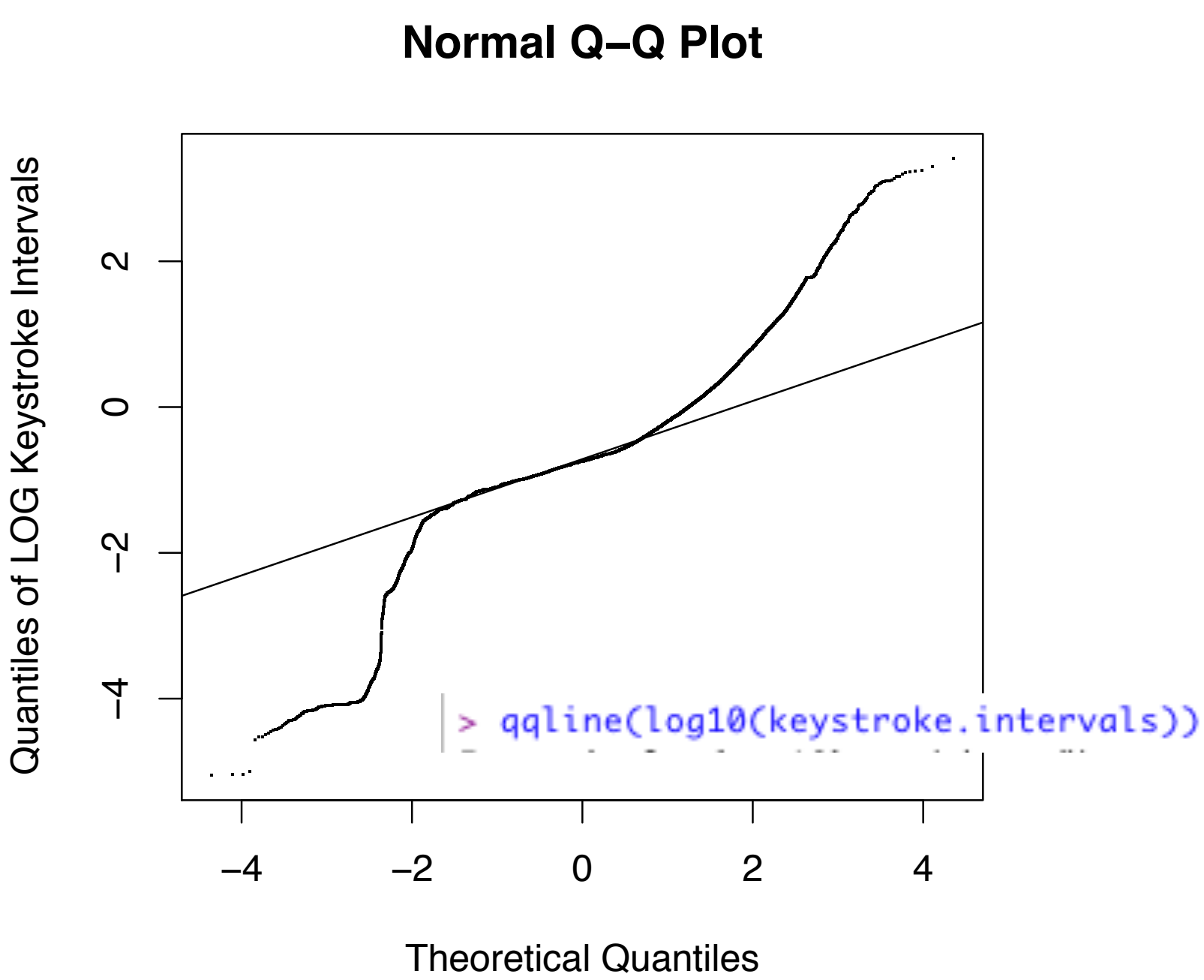
Figure 19. Distribution of TELNET packet interarrivals

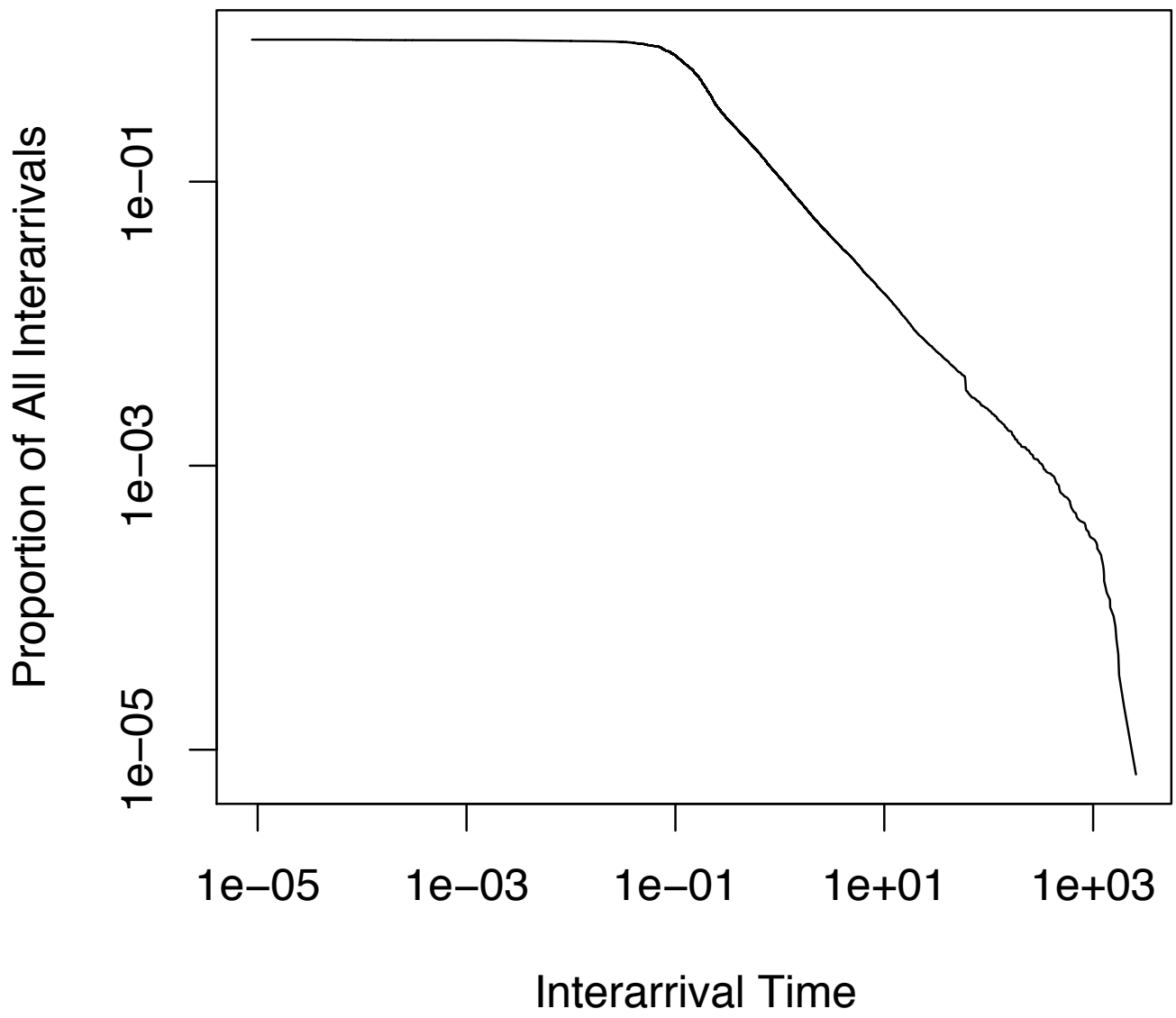
Exponential Distribution, Lambda = 12/sec

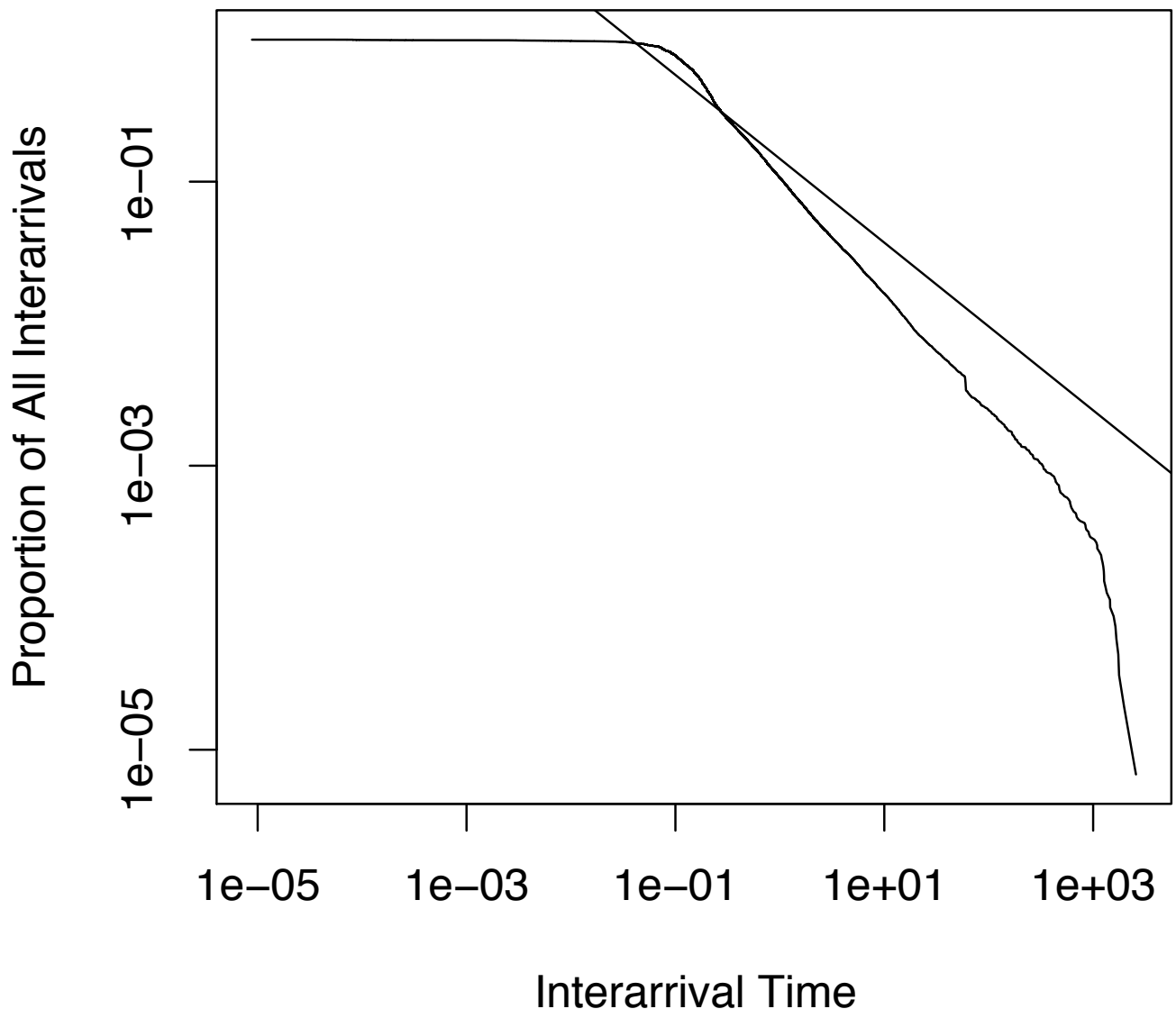


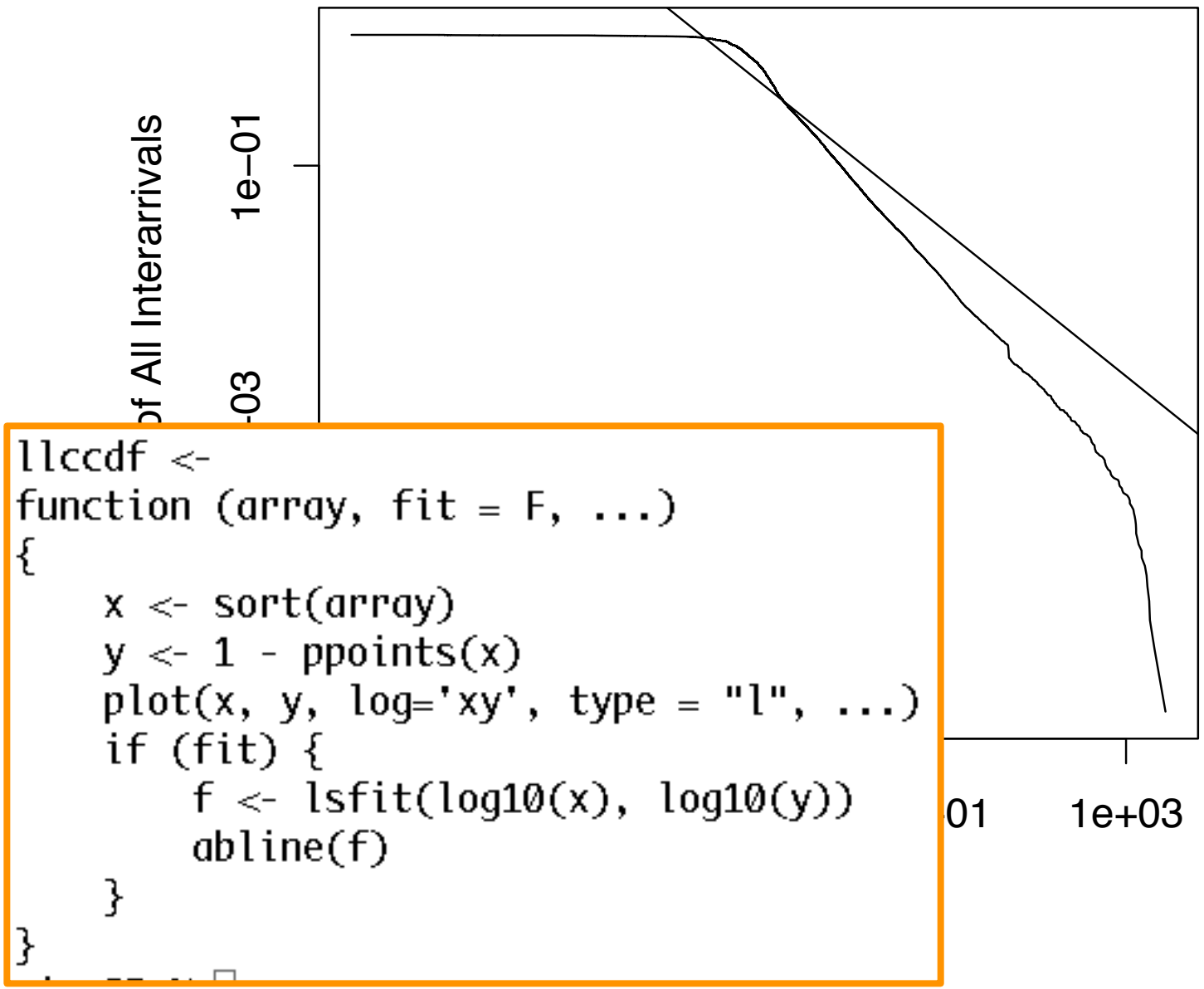

Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
1e−05
1e−03
1e−01
1e+01
1e+03
Keystroke Interarrival (Sec)


Proportion of Keystrokes
0.0
0.2
0.4
0.6
0.8
1.0
1e−05
1e−03
1e−01
1e+01
1e+03
Keystroke Interarrival (Sec)

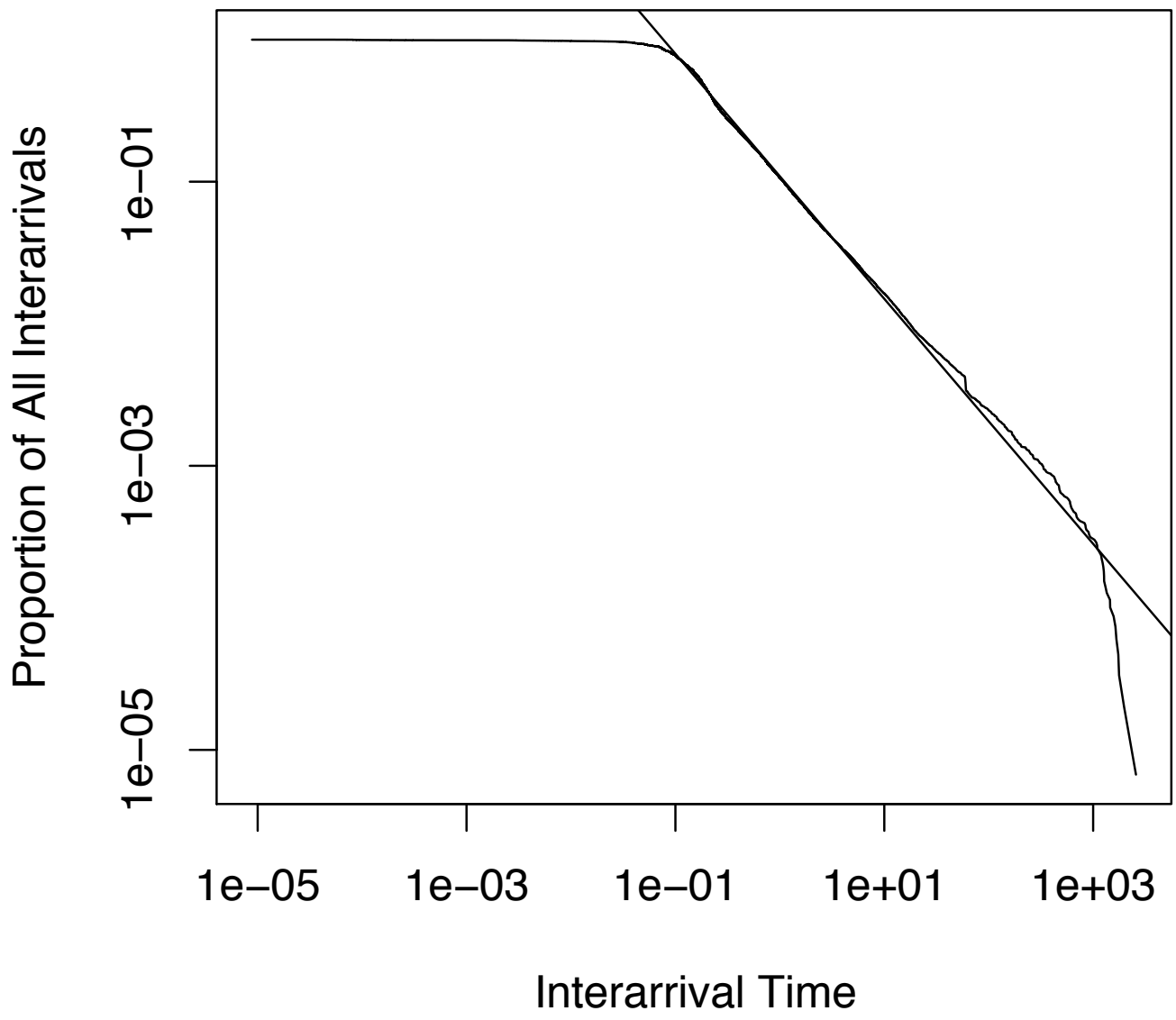

Normal Q–Q Plot
Quantiles of LOG Keystroke Intervals
Theoretical Quantiles
2
0
−2
−4
−4
−2
0
2
4
> qqline(log10(keystroke.intervals))

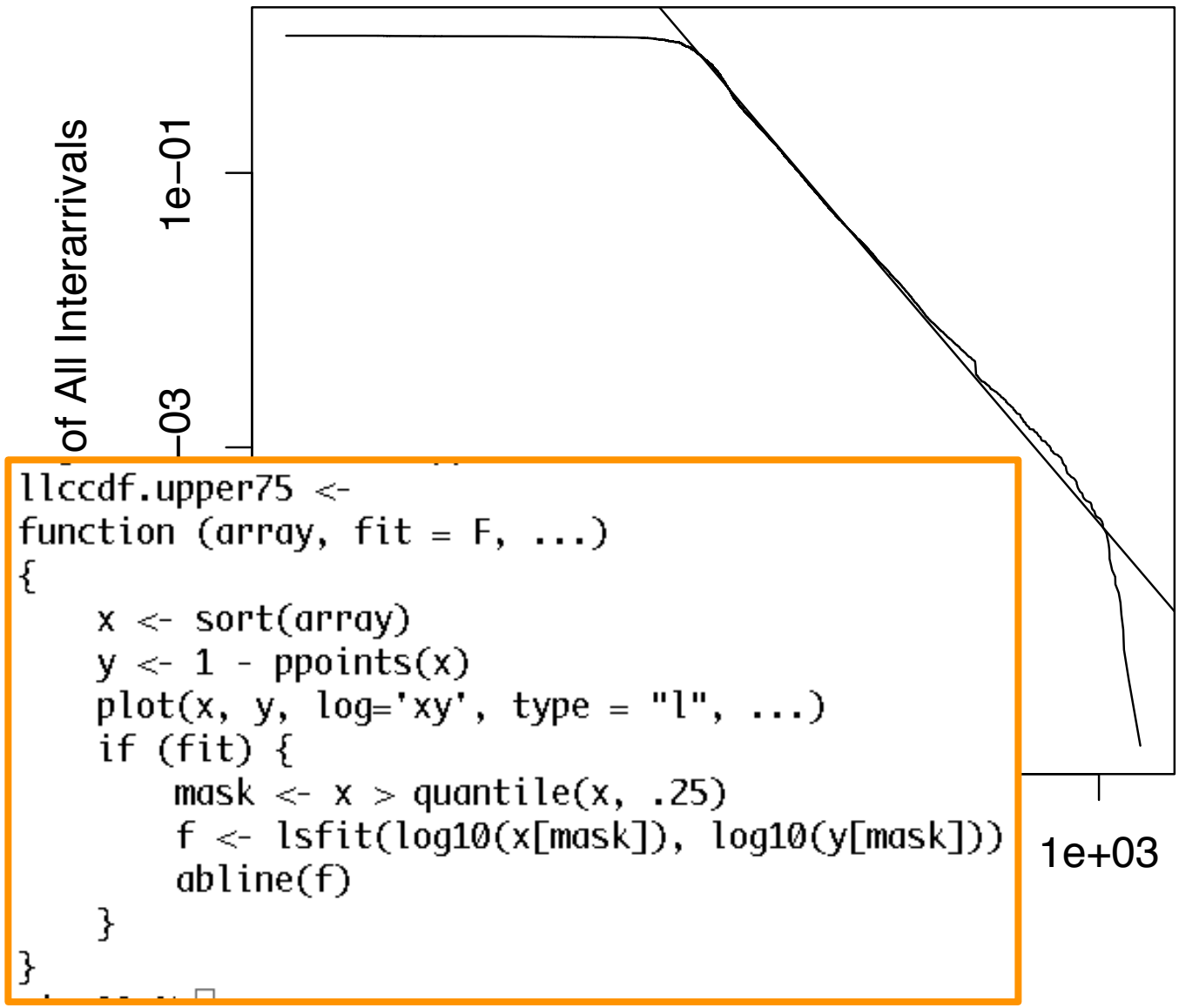

Proportion of All Interarrivals
1e−01
1e−03
1e−05
1e−05
1e−03
1e−01
1e+01
1e+03
Interarrival Time


Proportion of All Interarrivals
1e−01
1e−03
1e−05
1e−05
1e−03
1e−01
1e+01
1e+03
Interarrival Time

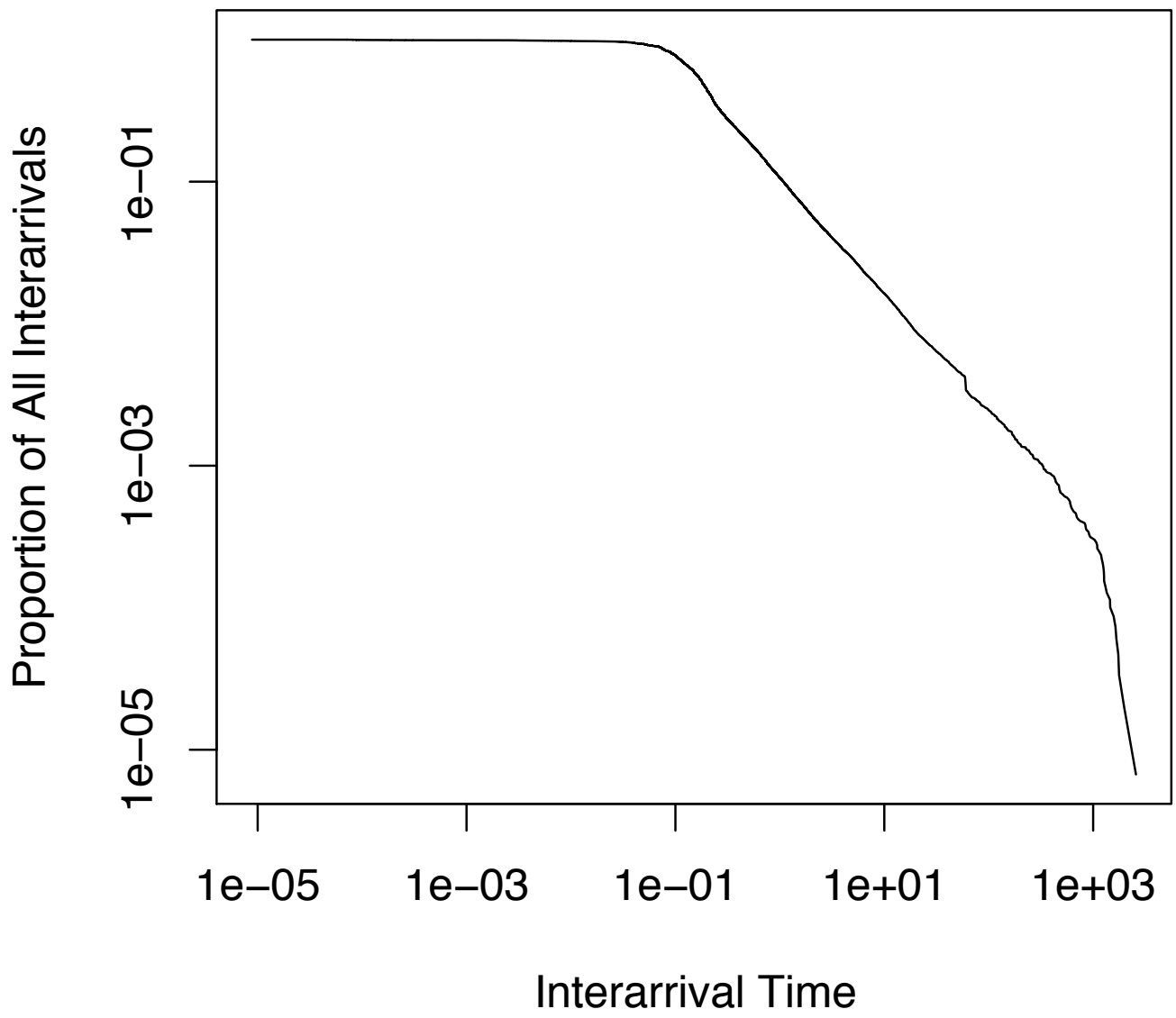


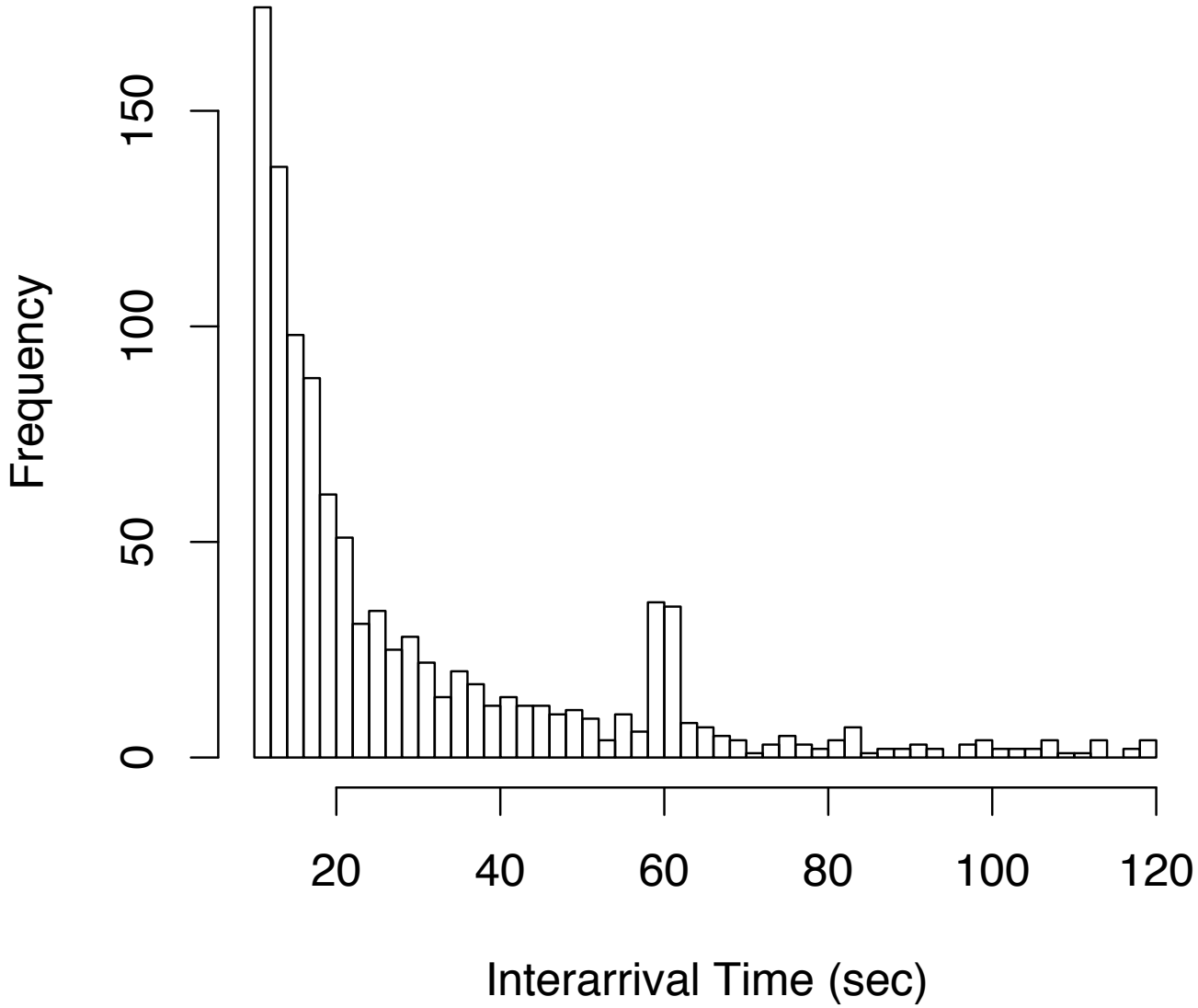

```
llccdf <-
function (array, fit = F, ...)
{
    x <- sort(array)
    y <- 1 - ppoints(x)
    plot(x, y, log='xy', type = "l", ...)
    if (fit) {
        f <- lsfit(log10(x), log10(y))
        abline(f)
    }
}
```


Proportion of All Interarrivals
1e−01
1e−03
1e−05
1e−05
1e−03
1e−01
1e+01
1e+03
Interarrival Time




```
llccdf.upper75 <-
function (array, fit = F, ...)
{
    x <- sort(array)
    y <- 1 - ppoints(x)
    plot(x, y, log='xy', type = "l", ...)
    if (fit) {
        mask <- x > quantile(x, .25)
        f <- lsfit(log10(x[mask]), log10(y[mask]))
        abline(f)
    }
}
```


Proportion of All Interarrivals
1e−01
1e−03
1e−05
1e−05
1e−03
1e−01
1e+01
1e+03
Interarrival Time


Frequency
0
50
100
150
20
40
60
80
100
120
Interarrival Time (sec)