Lab1_classe

September 30, 2025

1 LAB 1

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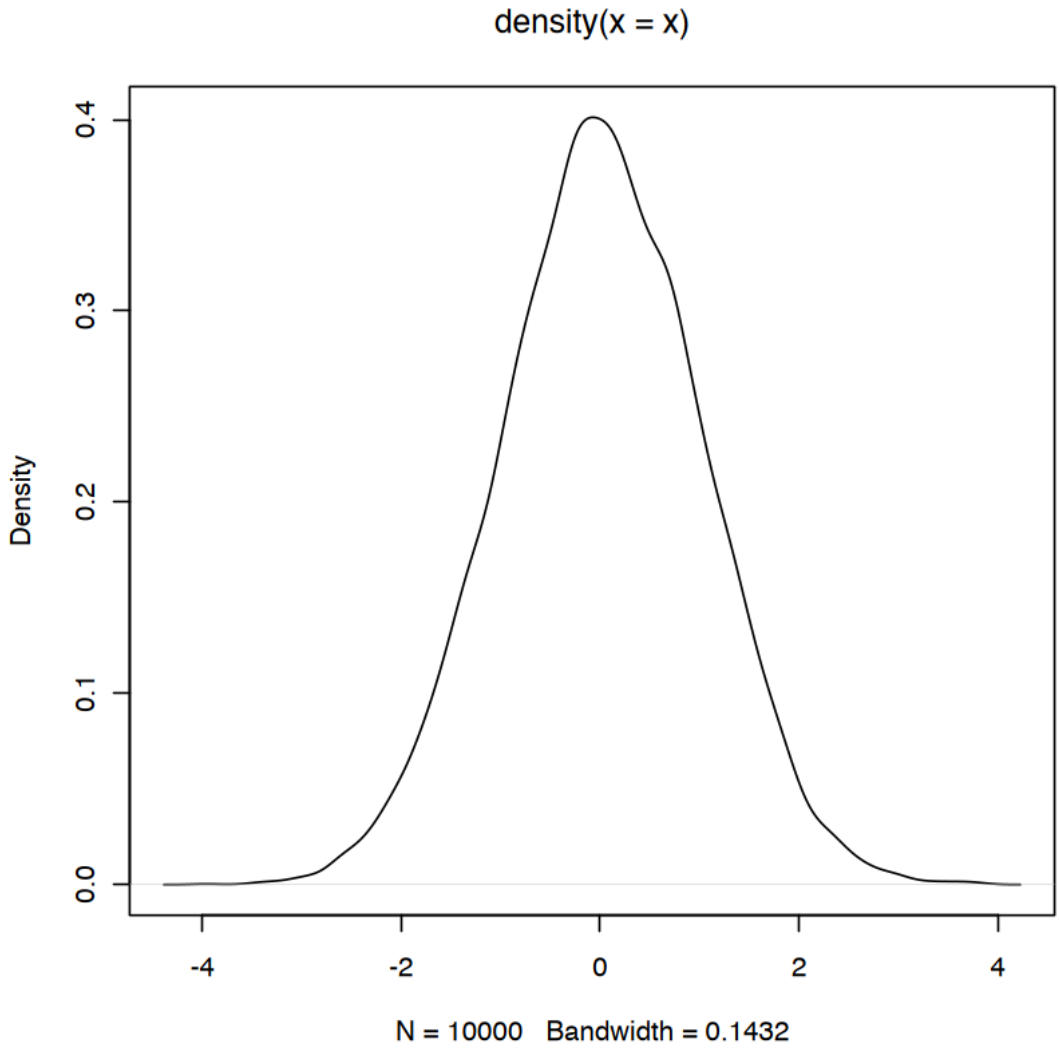
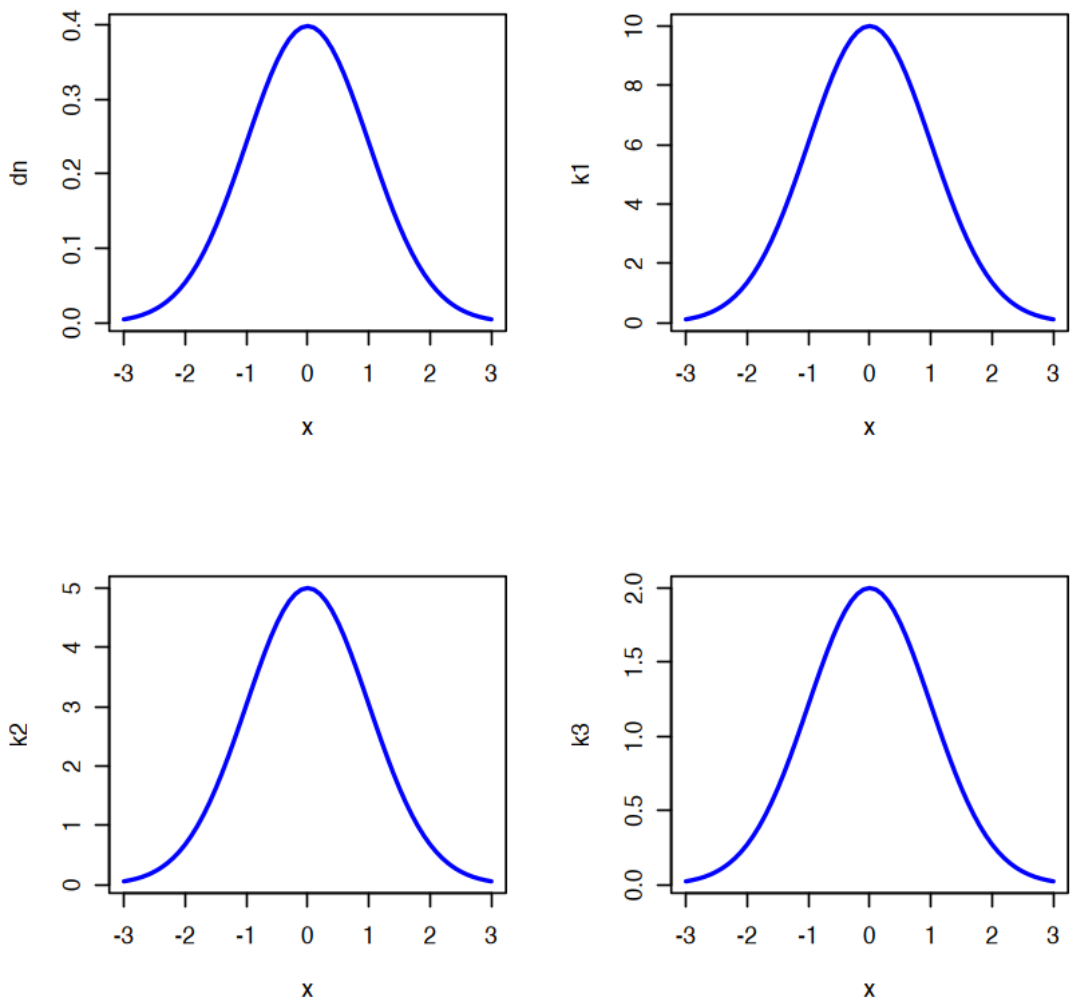


[9]:
```
x <- seq (-3,3, by=0.1)
```

[12]:
```
dn <- dnorm(x, 0, 1)

k1 <- exp(-0.5*(x - 0)^2 / 1) * 10
k2 <- exp(-0.5 * (x - 0)^2 / 1) * 5
k3 <- exp(-0.5 * (x - 0)^2 / 1) * 2
```

[14]:
```
par(mfrow=c(2,2))
plot(x, dn, type='l', col='blue', lwd=2)
plot(x, k1, type='l', col='blue', lwd=2)
plot(x, k2, type = "l", col = "blue", lwd = 2)
plot(x, k3, type = "l", col = "blue", lwd = 2)
```



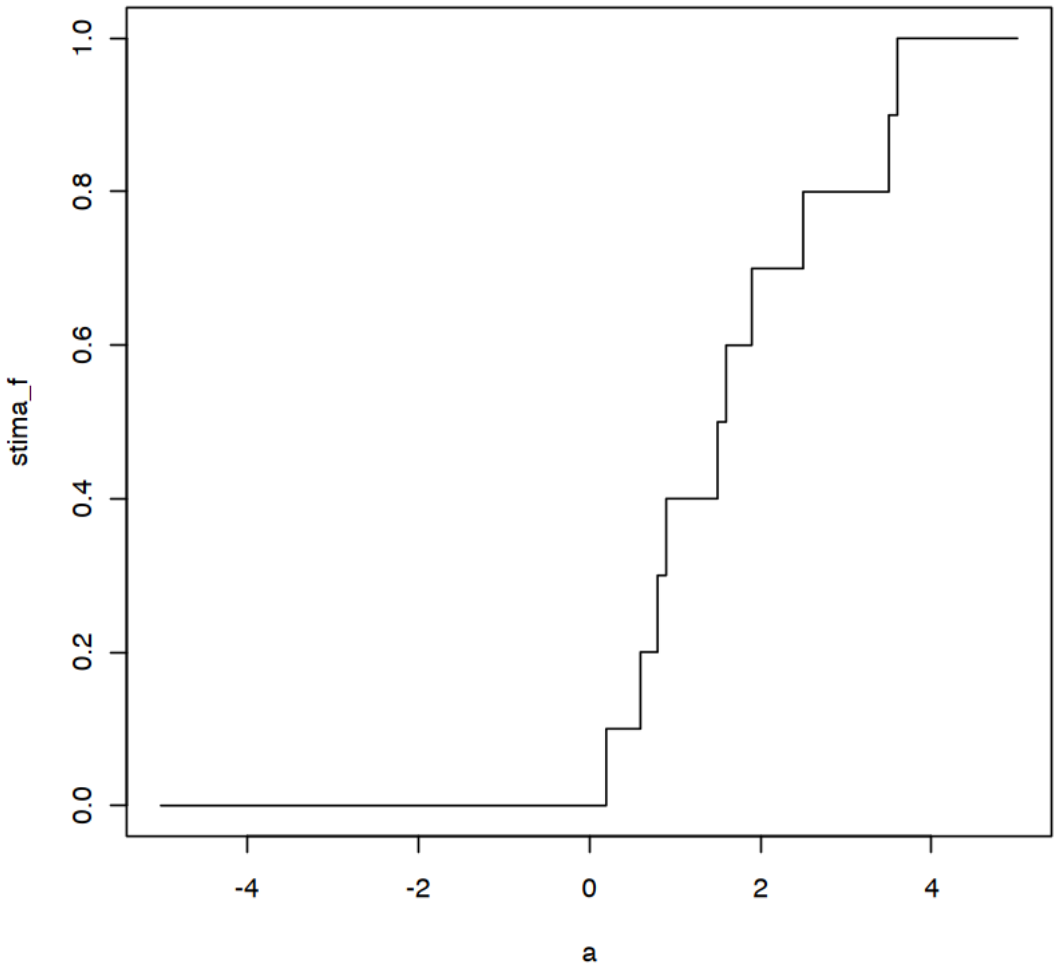
Stima monte carlo di una F

$$\hat{F}(a) = \frac{\sum 1_a(x_i)}{n}$$

[21]:
```
p <- runif(1,0,1)
n <- 10
if(p <0.5)
{
  x = rnorm(n,0,1)
}else{
  x = rgamma(n, shape = 2, rate = 1)
}
```

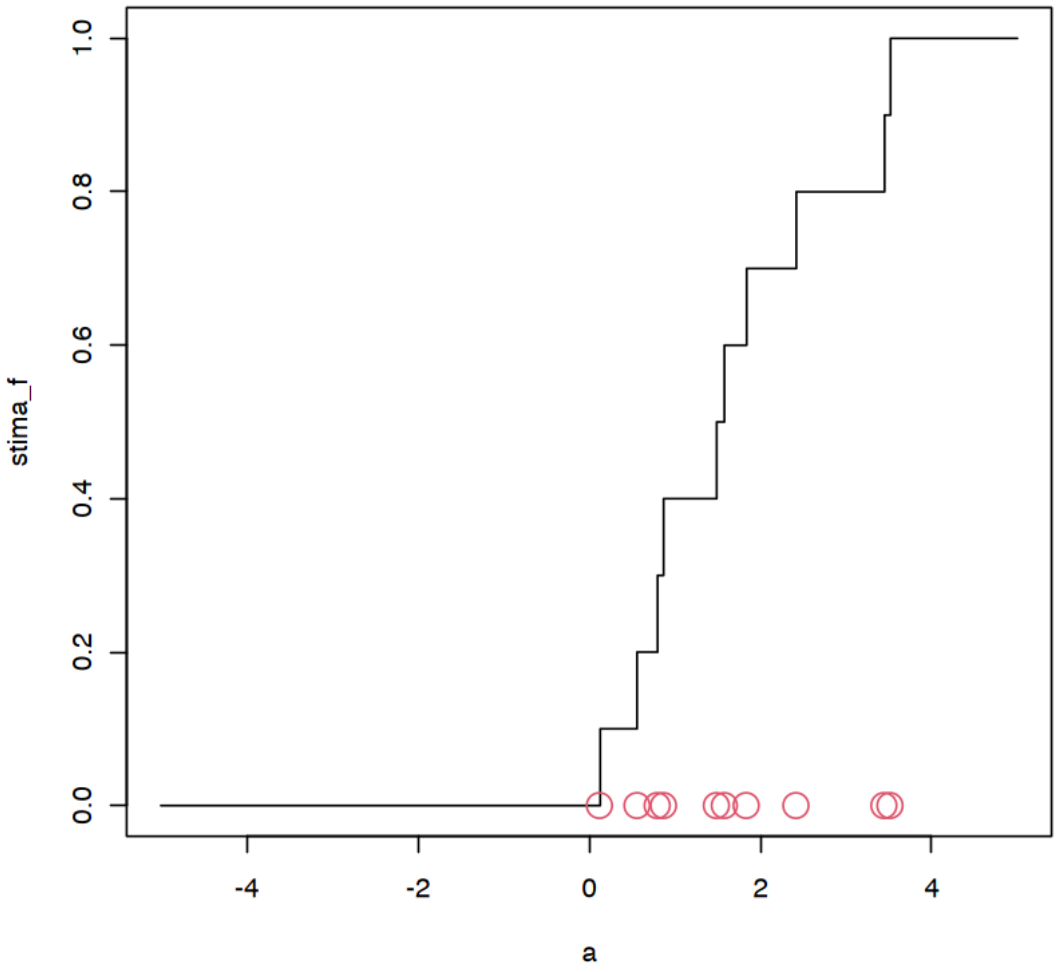
[30]:
```
a <- seq(-5,5, by = 0.01)
stima_f <- rep(NA, length(a))
for(j in 1:length(a))
{
  stima_f[j] <- sum(x <= a[j])/n
}
```

[ ]:
```
```



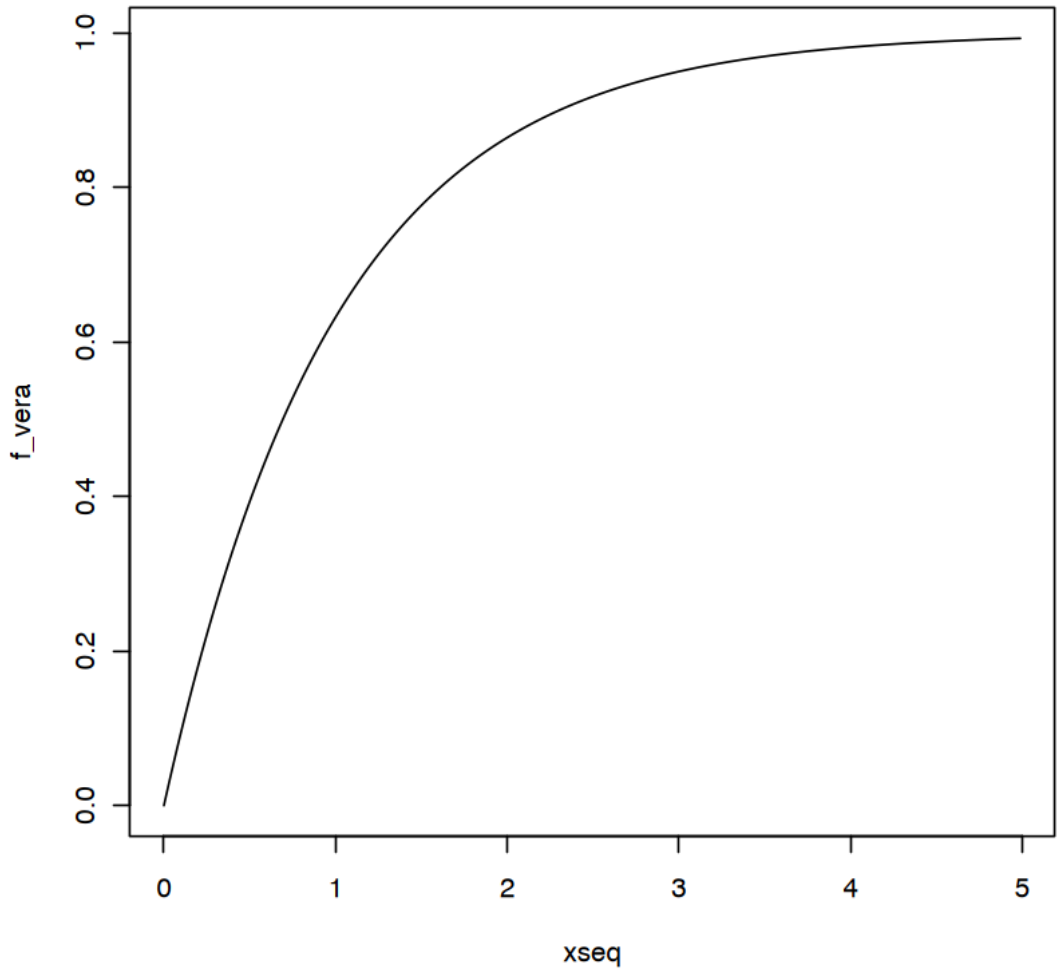
[31]:
```
sort(x)
plot(a, stima_f, type = "s")
points(x, rep(0,n), cex = 2, col=2)
```

1. 0.120105504546978 2. 0.558821707941467 3. 0.794842695595436 4. 0.86818817142503 5. 1.48629168648909 6. 1.57927074234573 7. 1.83367987060639 8. 2.4146967276864 9. 3.44198813401138 10. 3.51312540569764



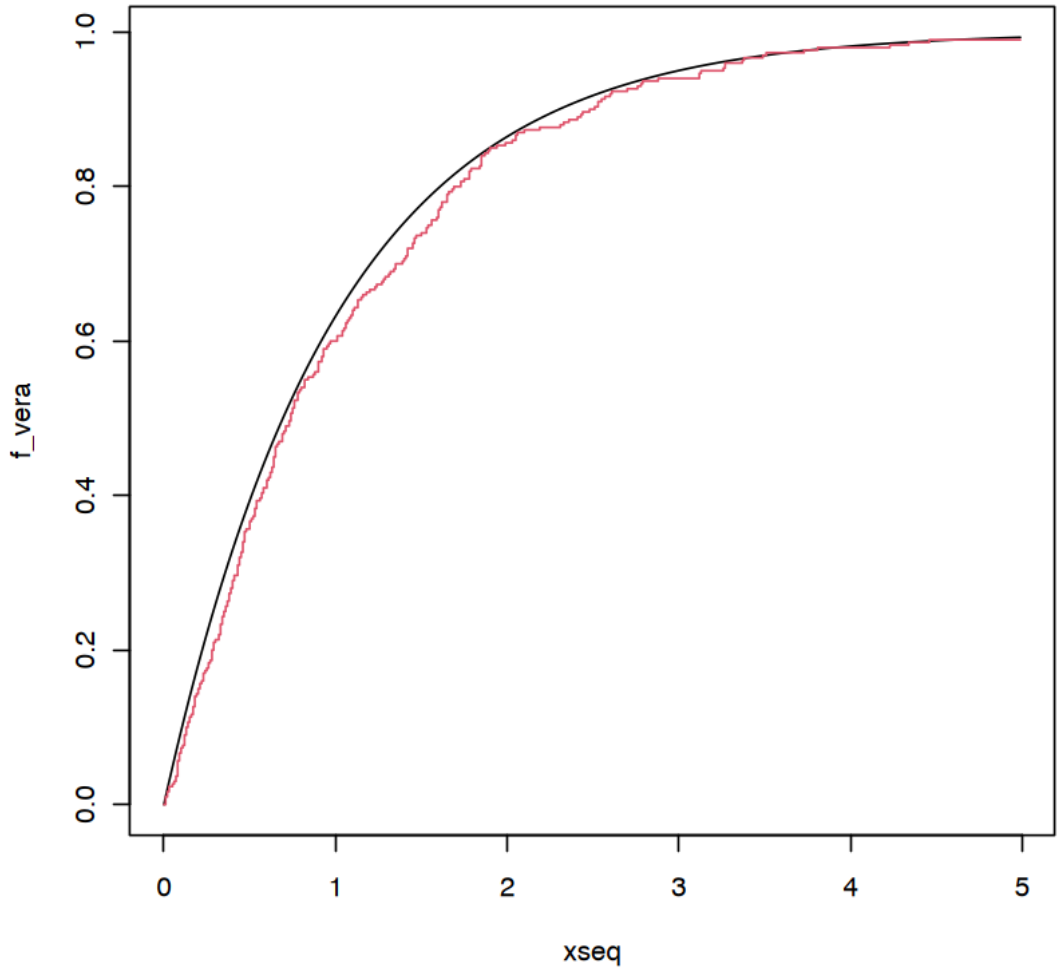
2 Simulazioni

[33]:
```
xseq <- seq(0.000001, 5, by = 0.01)
f_vera <- pgamma(xseq, 1, 1)
plot(xseq, f_vera, type="l")
```



[43]:
```
nsim <- 300
u <- runif(nsim, 0,1 )

xsim <- qgamma(u, 1,1)

#plot(density(xsim))

a <- seq(0.00001, 5, by = 0.01)
stima_f <- rep(NA, length(a))
for (j in 1:length(a))
{
  stima_f[j] <- sum(xsim <= a[j]) / nsim
}
```

```
plot(xseq, f_vera, type = "l")
lines(a, stima_f, type="s", col=2)
```



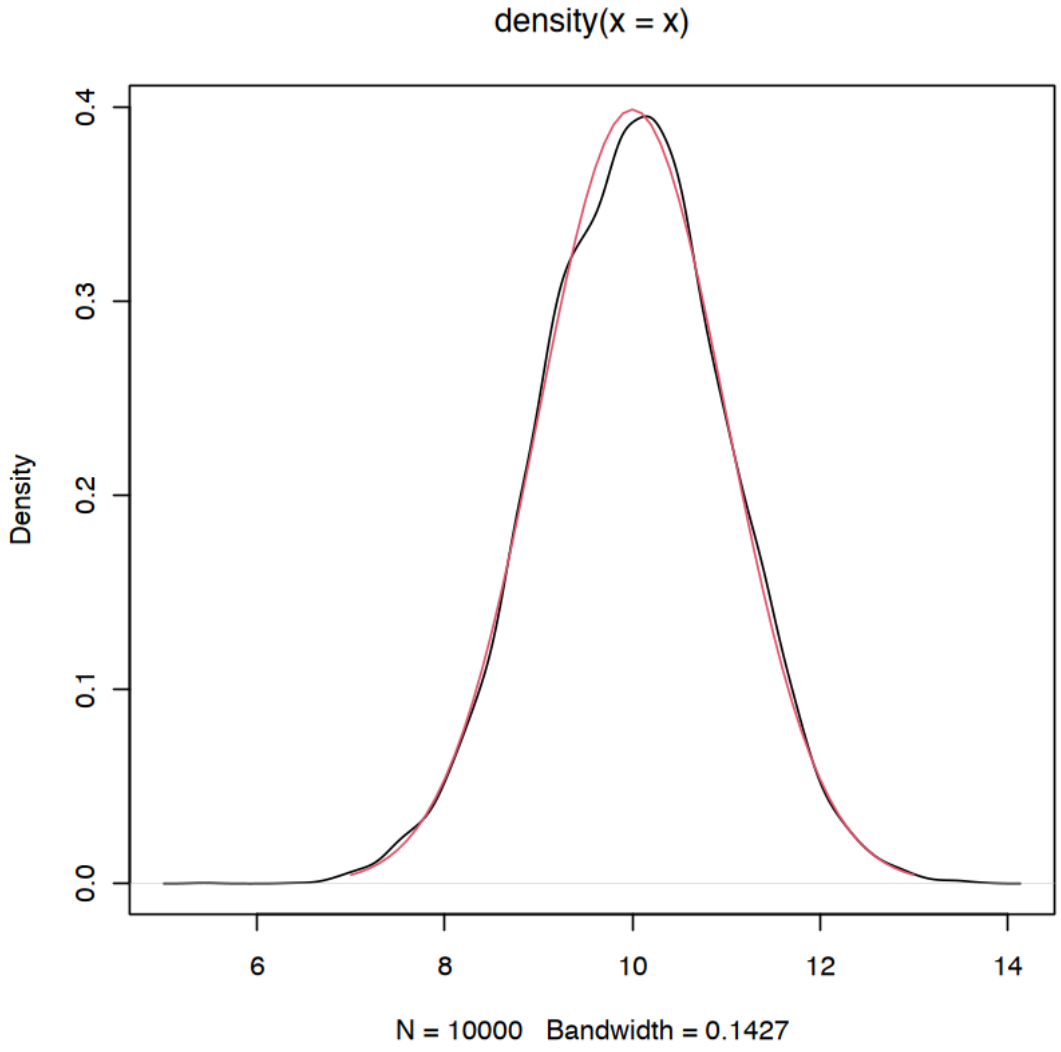
$$f(x,y) = f(x|y)f(y)$$

3

$$f(x,y) = f(x|y)f(y)$$

[48]:
```r
mu <- c(10,20)
sigma <- matrix( c(1,0.5,0.5,1), ncol=2 )

nsim <- 10000
x <- rep(NA, nsim)

for(i in 1:nsim)
{
  y <- rnorm(1, mu[2], sigma[2,2]^0.5)
  mu_cod <- mu[1] + sigma[1,2]/sigma[2,2] * (y - mu[2])
  var_cod <- sigma[1, 1] - sigma[1, 2] / sigma[2, 2] * sigma[1, 2]

  x[i] <- rnorm(1, mu_cod, var_cod^0.5)

}
```

[49]:
```r
xseq <- seq(7,13, by = 0.1)
plot(density(x))
lines(xseq, dnorm(xseq, mu[1], sigma[1,1]^0.5), col=2)
```


density(x = x)
Density
0.0
0.1
0.2
0.3
0.4
6
8
10
12
14
N = 10000 Bandwidth = 0.1427

[ ]: