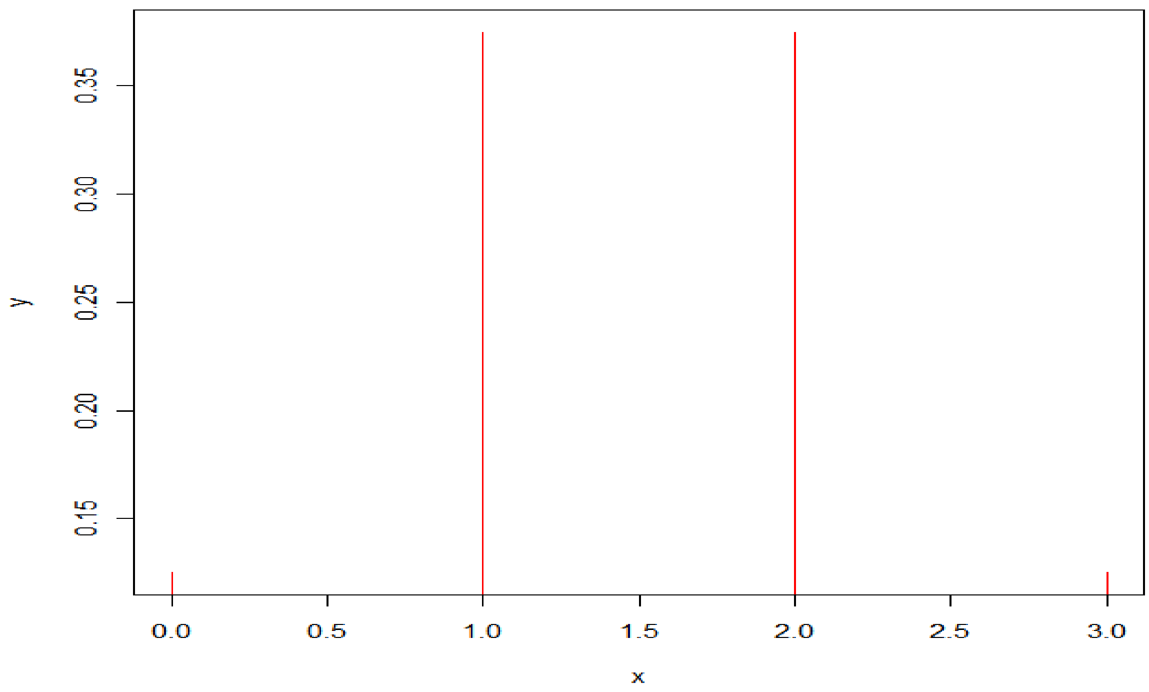
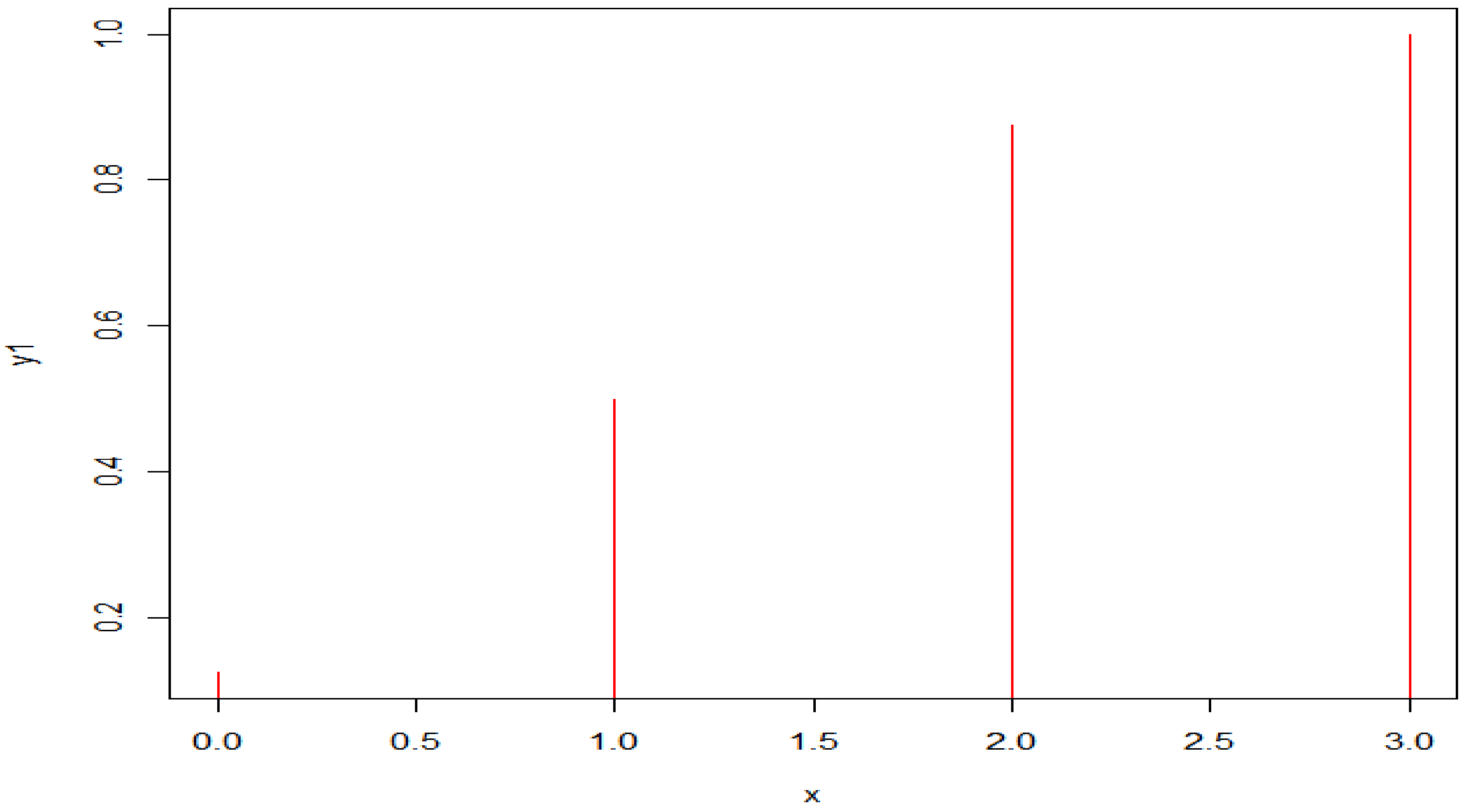
Sección 7
R

Ejemplo

```
x=c(0,1,2,3)
y= c(1/8,3/8,3/8,1/8)
plot(x,y,col="red", type = "h")
```



```
x=c(0,1,2,3)
y1=c(1/8,4/8,7/8,8/8)
plot(x,y1,col="red", type = "h")
```



Distribución Normal

- Teniendo en cuenta la distribución normal estándar *N*($\mu = 0$, $\sigma^2 = 1$).
- dnorm(-1)
- [1] 0.2419707
- Corresponde a los valores de la densidad de la normal

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\{-\frac{1}{2\sigma^2}(x-\mu)^2\}$$

En el punto -1 , si reemplazamos este valor en la expresión anterior, quedaría,

Con parámetros $N(\mu = 0, \sigma^2 = 1)$.

```
fx=(1/sqrt(2*pi))*exp((-1/2)*(-1)^2)
[1] 0.242
 pnorm(-1)
[1] 0.159
```

Calcula la probabilidad de $P(X \leq -1)$

qnorm(0.975)

[1] 1.96

El comando qnorm calcula el valor de a talque

$$P(X \leq a) = 0.975.$$

rnorm(10)

[1] 0.8699 -0.0830 -1.0721 -0.0716 1.5648 -1.2174
1.6563 0.3671 1.1055   0.1974

El comando rnorm genera 10 elementos de la normal estandar

```
args(rnorm)
function (n, mean = 0, sd = 1)
NULL
```

Las funciones relacionadas a la media tienen argumentos de media 0 y desviación estandar 1, estos argumentos pueden ser modificados a seguir.

```
qnorm(0.975, mean=100, sd=8)
[1] 116

qnorm(0.975, m=100, s=8)
[1] 116

qnorm(0.975, 100, 8)
[1] 116

help(rnorm)
```

- Ejemplo:
- Sea X una v.a con N(100,10)

- Calcular las probabilidades

1. $P[X < 95]$
2. $P[90 < X < 110]$
3. $P[X > 95]$

1. $P[X < 95]$

```
pnorm(95,100,10)
[1] 0.309
```

2. $P[90 < X < 110]$

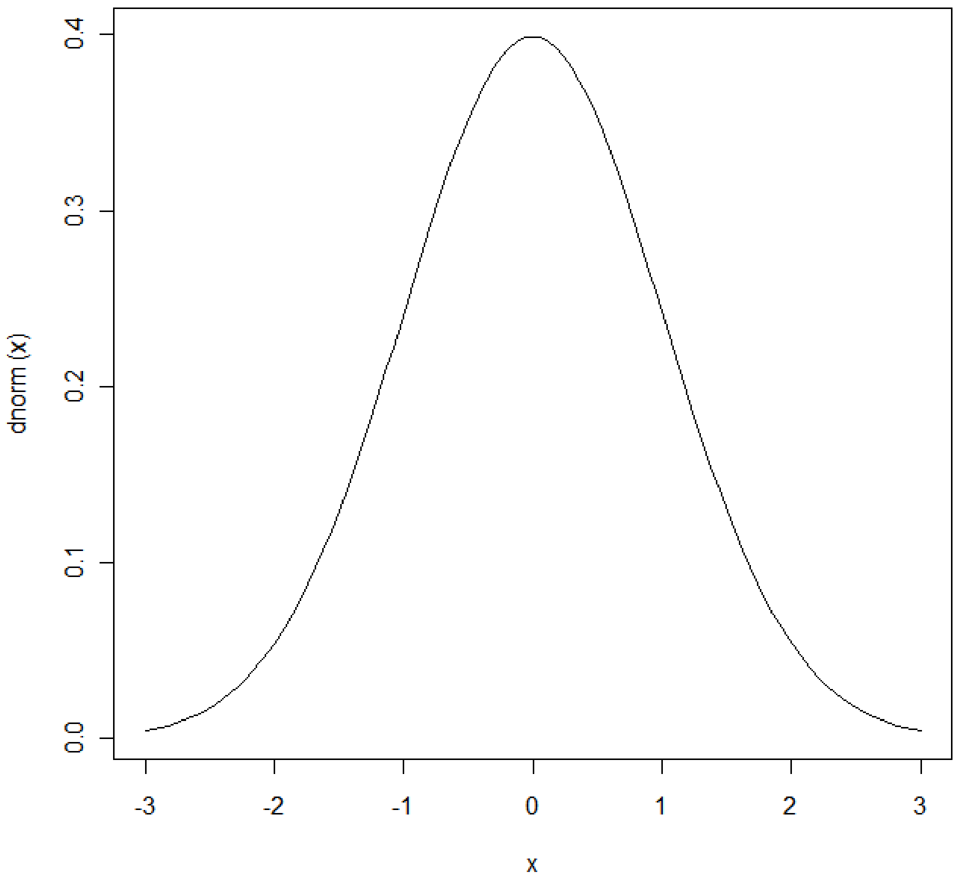
```
> pnorm(110,100,10)-pnorm(90,100,10)
[1] 0.683
```

3. $P[X > 95]$

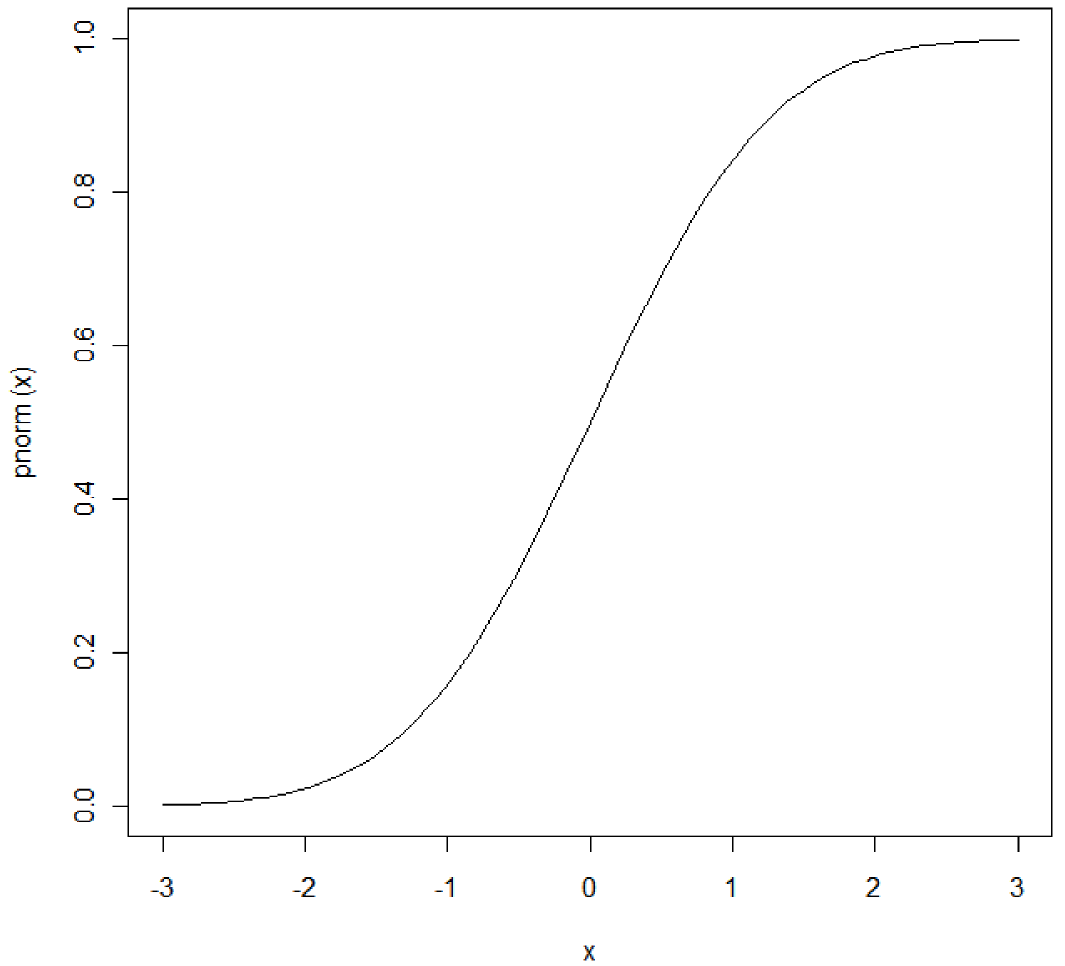
```
1-pnorm(95,100,10)
[1] 0.691

pnorm(95,100,10,lower=F)
[1] 0.691
```

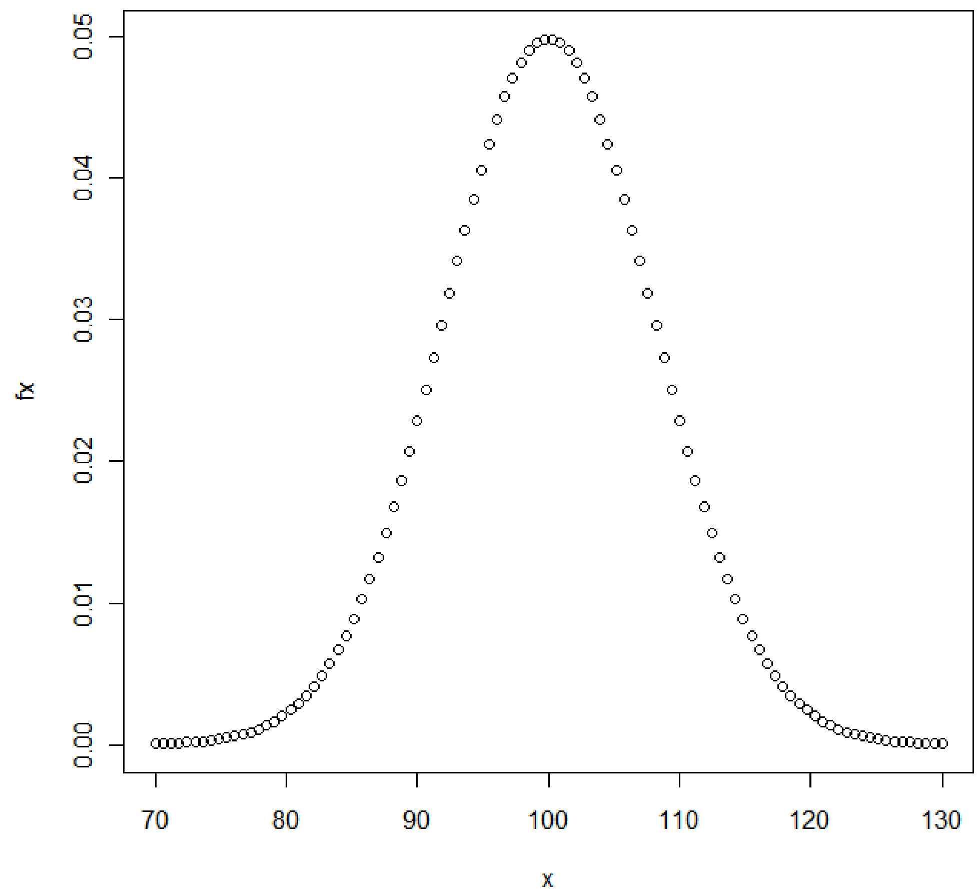
plot(dnorm, -3, 3)



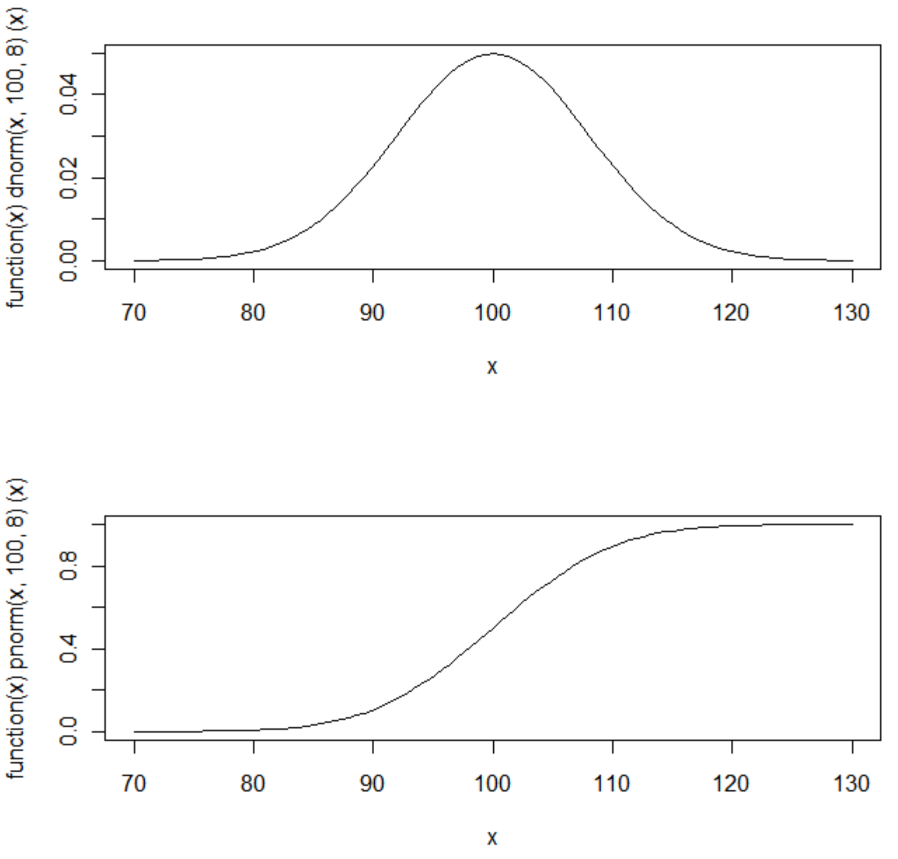
- plot(pnorm, -3, 3)



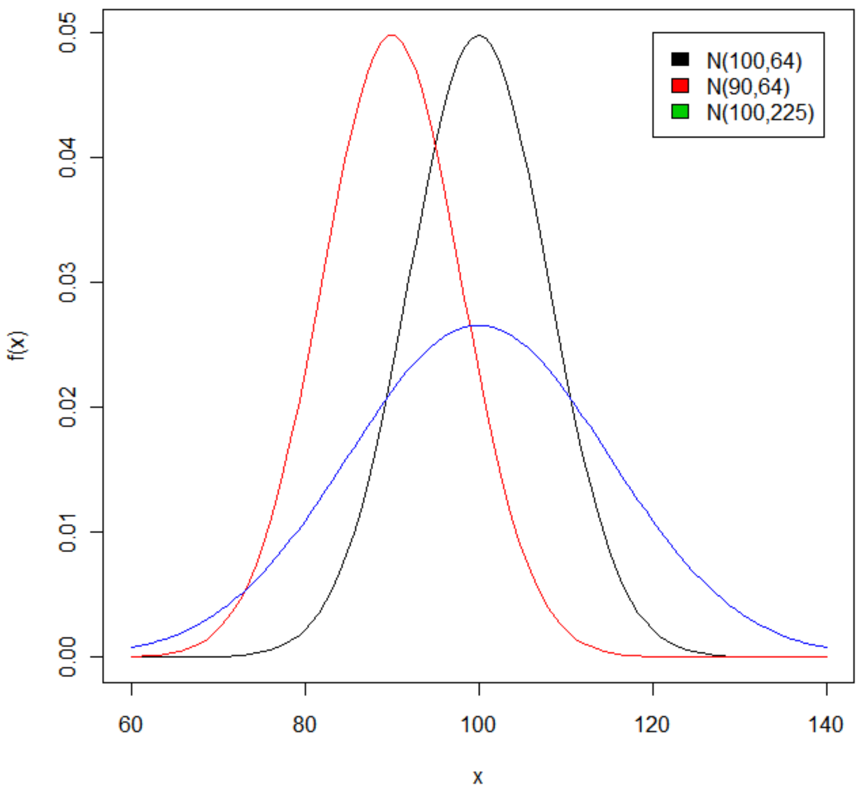
```
x <- seq(70, 130, len=100)
fx <- dnorm(x, 100, 8)
 plot(x, fx)
```



- par(mfrow=c(2,1))
- plot(function(x) dnorm(x, 100, 8), 70, 130)
- plot(function(x) pnorm(x, 100, 8), 70, 130)



```
plot(dnorm, -3, 3, xlab="valores de X", ylab="densidade de probabilidade")
title("Distribuic~ao Normal\nX ~ N(100, 64)")
plot(function(x) dnorm(x, 100, 8), 60, 140, ylab="f(x)")
 plot(function(x) dnorm(x, 90, 8), 60, 140, add=T, col="red")
plot(function(x) dnorm(x, 100, 15), 60, 140, add=T, col="blue")
legend(120, 0.05, c("N(100,64)","N(90,64)","N(100,225)"), fill=1:3)
```



Distribución Binomial

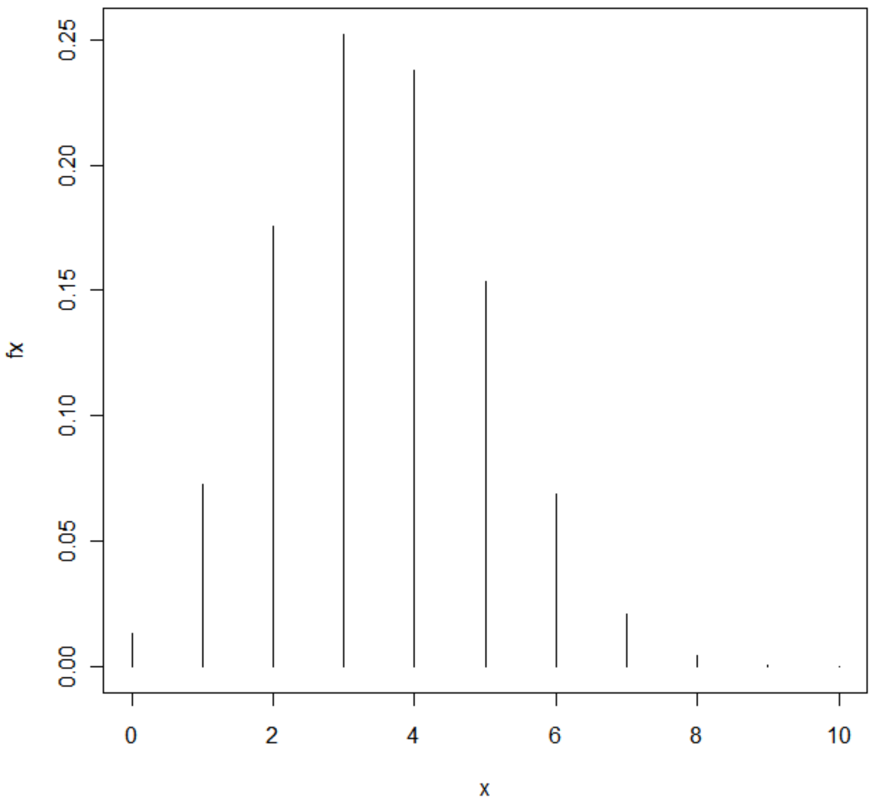
```
args(dbinom)
function (x, size, prob, log = FALSE)
NULL
```

Sea X una variable aleatoria con distribución binomial $n = 10$, $p = 0.35$

1. Realizar un gráfico de densidad

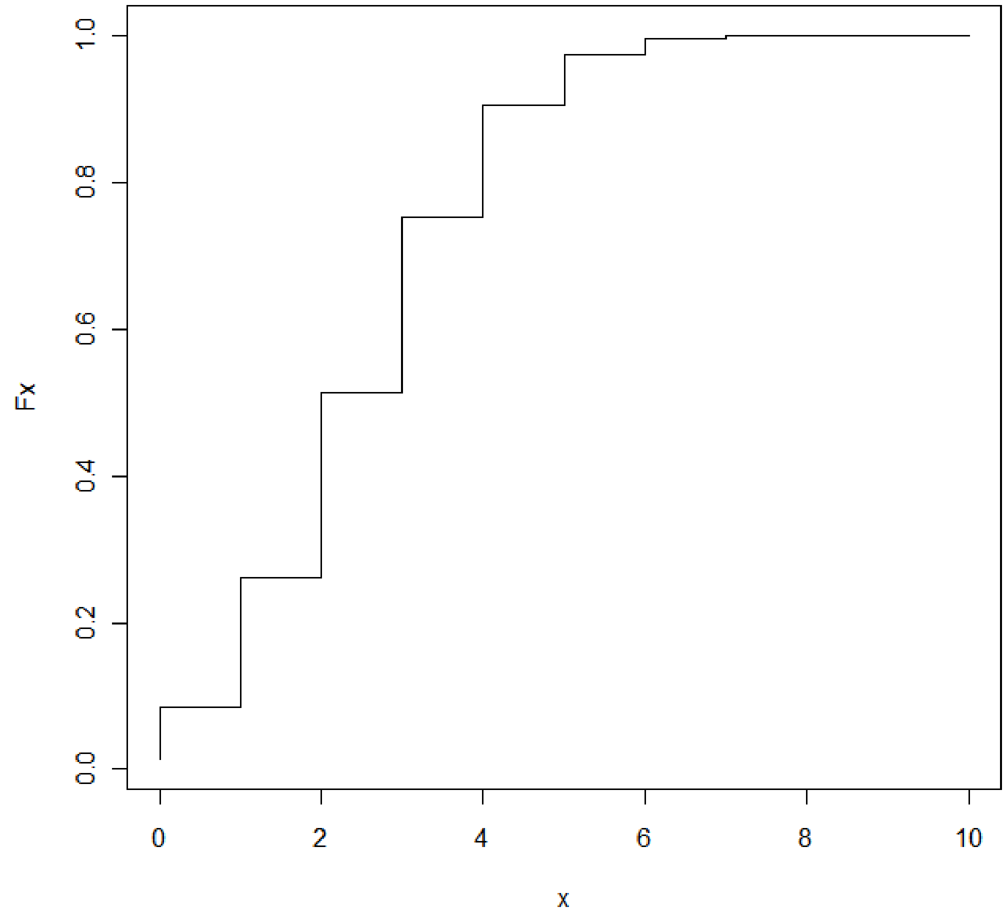
1. Grafico de la función de densidad

```
x <- 0:10
fx <- dbinom(x, 10, 0.35)
plot(x, fx, type="h")
```



2. Grafico de la función de probabilidad

```
Fx <- pbinom(x, 10, 0.35)
plot(x, Fx, type="S")
```



3. Calcular $P[X = 7]$

```
dbinom(7, 10, 0.35)
[1] 0.0212
```

4. Calcular $P[X < 8] = P[X \leq 7]$

```
pbinom(7, 10, 0.35)
[1] 0.995
```

```
sum(dbinom(0:7, 10, 0.35))
[1] 0.995
```

5. Calcular $P[X \geq 8] = P[X > 7]$

```
1-pbinom(7, 10, 0.35)
[1] 0.00482

pbinom(7, 10, 0.35, lower=F)
[1] 0.00482
```

6. Calcular $P[3 < X \leq 6] = P[4 \leq X < 7]$

```
pbinom(6, 10, 0.35) - pbinom(3, 10, 0.35)
[1] 0.46

sum(dbinom(4:6, 10, 0.35))
[1] 0.46
```

Ejercicios

Siendo X una variable siguiendo la distribución binomial con parámetro n=15 y p=0.4 .

Halle:

- $P(X \geq 14)$
- $P(8 < X \leq 10)$
- $P(X < 2 \text{ ou } X \geq 11)$
- $P(X \geq 11 \text{ ou } X > 13))$
- $P(X > 3 \text{ e } X < 6)$
- $P(X \leq 13 \mid X \geq 11)$

- Para X ~ N(90,10), obtenga

  - $P(X \leq 115)$
  - $P(X \geq 80)$
  - $P(X \leq 75)$
  - $P(85 \leq X \leq 110)$
  - $P(|X - 90| \leq 10)$

- Sea X una variable siguiendo el modelo normal , de media 130 y varianza 64

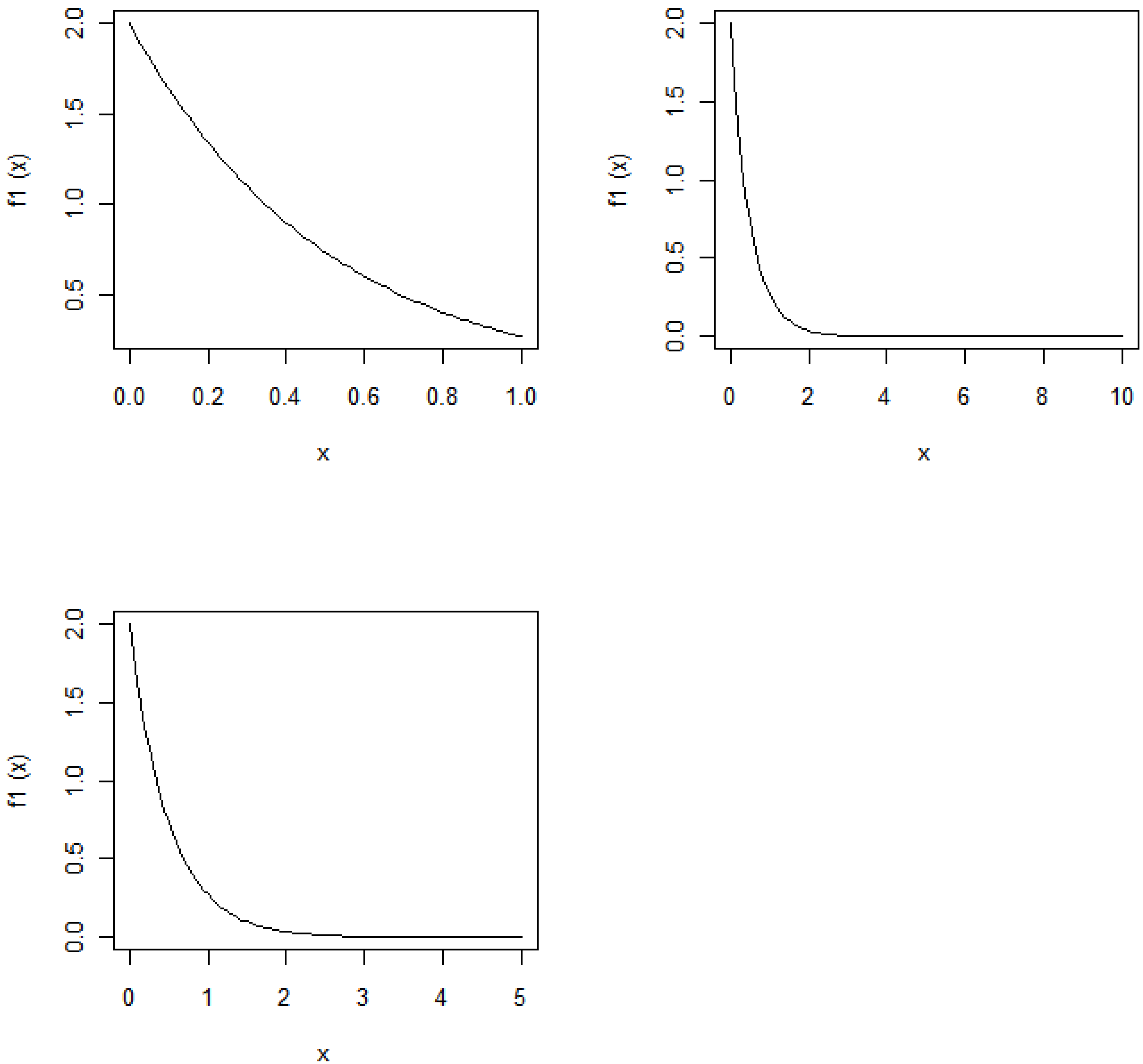
- Halle

(a) $P(X \geq 120)$ (b) $P(135 < X \leq 145)$ (c) $P(X < 120 \text{ ou } X \geq 150)$

Distribución de probabilidad

$$f(x) = \begin{cases} 2\exp(-2x) & , \text{se } x \geq 0 \\ 0 & , \text{se } x < 0 \end{cases}$$

```
f1 <- function(x){
fx <- ifelse(x < 0, 0, 2*exp(-2*x))
return(fx)
}
par(mfrow=c(2,2))
plot(f1)
plot(f1,0,10)
plot(f1,0,5)
```



f1 (x)
2.0
1.5
1.0
0.5
0.0
0.2
0.4
0.6
0.8
1.0
x
f1 (x)
0.0
0.5
1.0
1.5
2.0
0
2
4
6
8
10
x
f1 (x)
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5
x