SR NO.	PRACTICAL NAME	DATE	SIGN
01.	Using R execute the basic commands, array, list, and frames.	12-01-19	
02.	Create a matrix using R and perform the operations Addition, Substraction, Multiplication, Division, Transpose and Inverse.	12-01-19	
03.	Using R execute the statistical functions: Mean, Median, Mode and Range.	19-01-19	
04.	Using R import the data from Excel/.CSV file and calculate the Standard deviation, Variance and Co-variance.	19-01-19	
05.	Using R import the data from Excel/.CSV file and draw the skewness.	09-02-19	
06.	Import the data from Excel/.CSV file and perform the hypothetical testing.	16-02-19	
07	Import the data from Excel/.CSV file and perform the Chi-squared Test.	23-02-19	
08.	Using R perform the binomial and normal distribution on the data.	16-03-19	

Rstudio.

PRACTICAL NUMBER-1

Q) Using R execute the basic commands, array, list and frames.

SOLUTION:-

i)Basic commands.

SOLUTION:-

```
> mytext<-"Good Morning"
> print(mytext)
[1] "Good Morning"
> |
```

~~Programming to~~ Solve

ii)Array

SOLUTION:-

```
> A<-array(c('yes','no'),dim=c(3,3,2))
> print(A)
, , 1

     [,1]  [,2]  [,3]
[1,] "yes" "no"  "yes"
[2,] "no"  "yes" "no"
[3,] "yes" "no"  "yes"

, , 2

     [,1]  [,2]  [,3]
[1,] "no"  "yes" "no"
[2,] "yes" "no"  "yes"
[3,] "no"  "yes" "no"

> |
```

iii)List

SOLUTION:-

```
> list1<-list(c(1,2,3),4.5,5,sin)
> print(list1)
[[1]]
[1] 1 2 3

[[2]]
[1] 4.5

[[3]]
[1] 5

[[4]]
function (x)  .Primitive("sin")

> |
```

iv)Data frames.

SOLUTION:-

```
> roll=c(1,2,3)
> name=c("abc","xyz","pqr")
> df=data.frame(roll,name)
> print(df)
  roll name
1    1  abc
2    2  xyz
3    3  pqr
> |
```

PRACTICAL NUMBER-2

Q) Create a matrix using R and perform the operations Addition, Substraction, Multiplication, Division, Transpose and Inverse

SOLUTION:-

Matrix1-

SOLUTION:-

```
> matrix1<-matrix(c(1,2,3,4),nrow=2)
> print(matrix1)
     [,1] [,2]
[1,]    1    3
[2,]    2    4
> |
```

Matrix2-

SOLUTION:-

```
> matrix2<-matrix(c(5,6,7,8),nrow=2)
> print(matrix2)
     [,1] [,2]
[1,]    5    7
[2,]    6    8
> |
```

i)Addition

SOLUTION:-

```
> addition<-matrix1+matrix2
> print(addition)
     [,1] [,2]
[1,]    6   10
[2,]    8   12
> |
```

ii)Substraction:-

SOLUTION:-

```
> substraction<-matrix1-matrix2
> print(substraction)
     [,1] [,2]
[1,]   -4   -4
[2,]   -4   -4
> |
```

iii)Multiplication

SOLUTION:-

```
> multiplication<-matrix1%*%matrix2
> print(multiplication)
     [,1] [,2]
[1,]   23   31
[2,]   34   46
> |
```

iv)Division

SOLUTION:-

```
> division<-matrix1/matrix2
> print(division)
          [,1]      [,2]
[1,] 0.2000000 0.4285714
[2,] 0.3333333 0.5000000
>
```

v)Transpose

SOLUTION:-

```
> transpose<-t(matrix1)
> print(transpose)
     [,1] [,2]
[1,]    1    2
[2,]    3    4
>
```

vi)Inverse

SOLUTION:-

```
> determinant<-det(matrix1)
> print(determinant)
[1] -2
> inverse<-solve(matrix1)
> print(inverse)
     [,1] [,2]
[1,]   -2  1.5
[2,]    1 -0.5
>
```

PRACTICAL NUMBER-3

Q) Using R calculate the statistical functions: Mean, Median, Mode, Range.

SOLUTION:-

Data

SOLUTION:-

```
> v<-c(1,2,3,4,5)
> print(v)
[1] 1 2 3 4 5
>
```

i)Mean

SOLUTION:-

```
> result<-mean(v)
> print(result)
[1] 3
>
```

ii)Median

SOLUTION:-

```
> result<-median(v)
> print(result)
[1] 3
>
```

iii)Mode

SOLUTION:-

```
> getmode<-function(v)
+ {
+ uniq<-unique(v)
+ uniq[which.max(tabulate(match(v,uniq)))]
+ }
> v<-c(1,2,3,4,4,5,6,7)
> result<-getmode(v)
> print(result)
[1] 4
>
```

iv)Range

SOLUTION:-

```
> result<-range(v)
> print(result)
[1] 1 7
>
```

PRACTICAL NUMBER-4

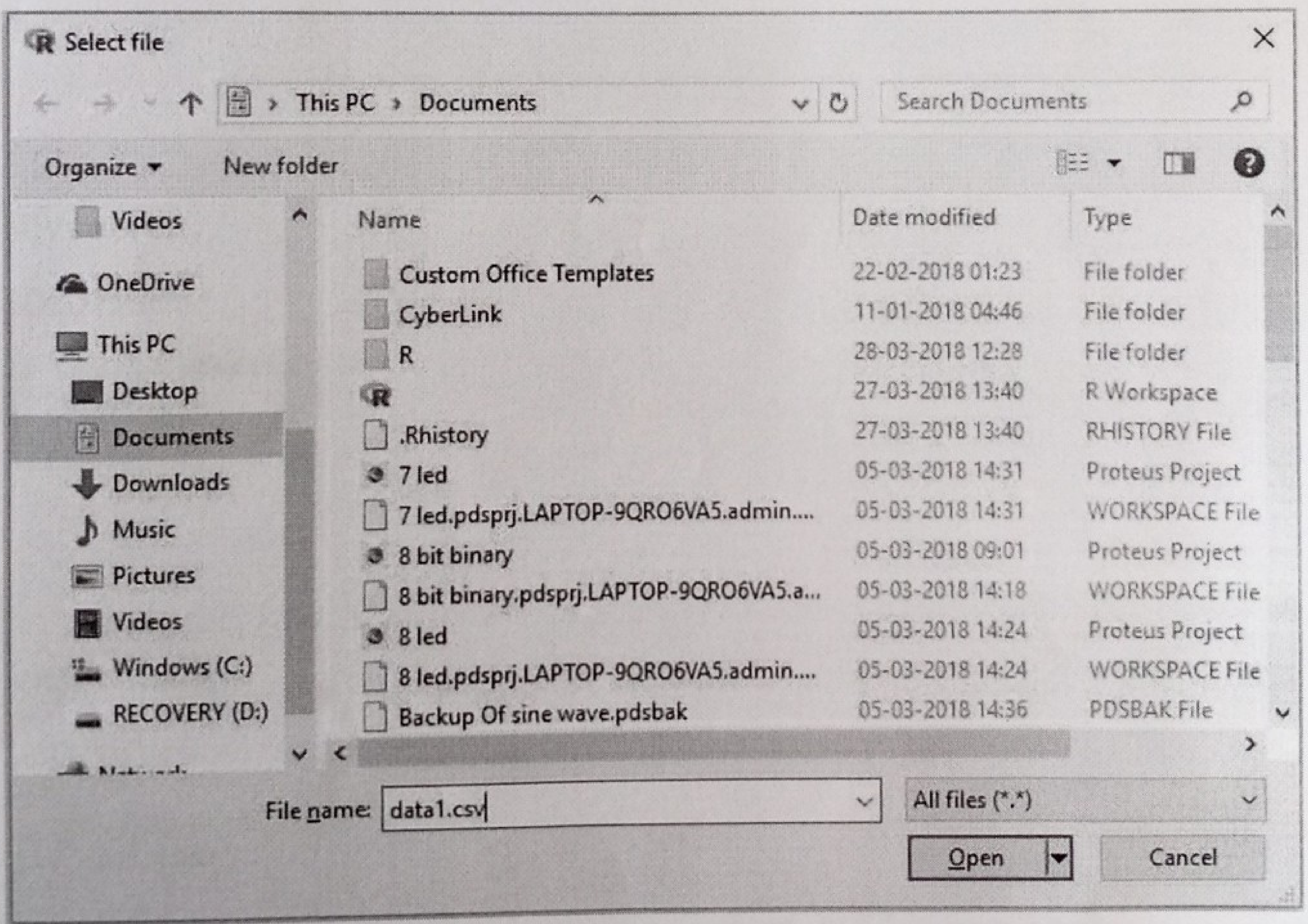
Q) Using R import the data from excel/.CSV file and calculate the S.D, Variance, Co-variance.

SOLUTION:-

First make an Excel file and save it with .csv extension

	A	B	C
1	rollno	name	marks
2	1	a	50
3	2	b	40
4	3	c	30
5	4	d	20

```
> data<-read.csv(file.choose(),header=T)
```



```
> data
  rollno name marks
1      1    a    50
2      2    b    40
3      3    c    30
4      4    d    20
>
```

i)Mean

SOLUTION:-

```
> mean(data$marks)
[1] 35
>
```

ii)Standard Deviation

SOLUTION:-

```
> sd(data$marks)
[1] 12.90994
>
```

iii)Variance

SOLUTION:-

```
> var(data$marks)
[1] 166.6667
>
```

iv)Co-variance

SOLUTION:-

```
> cov(data$roll,data$marks)
[1] -16.66667
>
```

PRACTICAL NUMBER-5

Q) Using R import the data from Excel/.CSV file and draw the skewness.

SOLUTION:-

```
> install.packages("Moments")
```


```
> time1<-c(19.09,19.55,17.89,17.73,25.15,27.27,25.24,21.65,20.92,22.61,15.71,22.04,22.60,24.25)
> library("moments")
> skewness(time1)
[1] -0.04637707
```

PRACTICAL NUMBER-6

Q) Import the data from Excel/.CSV and perform the hypothetical testing.

SOLUTION:-

i)Lower tail test of population mean with known variance.

Q) Suppose the manufacturer claims that the mean lifetime of a light bulb is more than 10,000 hours. In a sample of 30 light bulbs, it was found that they only last 9,900 hours on average. Assume the population standard deviation is 120 hours. At 0.05 significance level, can we reject the claim by the manufacturer?

SOLUTION:-

```
> xbar=9900
> mu0=10000
> sigma=120
> n=30
> z=(xbar-mu0)/(sigma/sqrt(n))
> z
[1] -4.564355
> alpha=0.05
> z.alpha=qnorm(1-alpha)
> z.alpha
[1] 1.644854
> |
```

ii)Upper tail test of population mean with known variance.

Q)Suppose the food lebel on a cookie bag states that there is at most 2 grams of saturated fat in a single cookie. In a sample of 35 cookies, it is found that the mean amount of saturated fat per cookie is 2.1 grams. Assume that the population standard deviation is 0.25 grams. At 0.05 significance level, can we reject the claim on food label?

SOLUTION:-

```
> xbar=2.1
> mu0=2
> sigma=0.25
> n=35
> z=(xbar-mu0)/(sigma/sqrt(n))
> z
[1] 2.366432
> alpha=0.05
> z.alpha=qnorm(1-alpha)
> z.alpha
[1] 1.644854
> |
```

iii) Two-tailed test of population mean with known variance

Q)Suppose the mean weight of King Penguins found in an Antarctic colony last year was 15.4 kg. In a sample of 35 penguins same time this year in the same colony, the mean penguin weight is 14.6 kg. Assume the population standard deviation is 2.5 kg. At 0.05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year?

SOLUTION:-

```
> xbar=14.6
> mu0=15.4
> sigma=2.5
> n=35
> z=(xbar-mu0)/(sigma/sqrt(n))
> z
[1] -1.893146
> alpha=0.05
> z.half.alpha=qnorm(1-alpha/2)
> c(-z.half.alpha,z.half.alpha)
[1] -1.959964  1.959964
> |
```

iv)Two-tailed test of population mean with unknown variance.

Q)Suppose the mean weight of King Penguins found in an Antarctic colony last year was 15.4 kg. In a sample of 35 penguins same time this year in the same colony, the mean penguin weight is 14.6 kg. Assume the sample standard deviation is 2.5 kg. At 0.05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year?

SOLUTION:-

```
> xbar=14.6
> mu0=15.4
> sigma=2.5
> n=35
> z=(xbar-mu0)/(sigma/sqrt(n))
> z
[1] -1.893146
> alpha=0.05
> t.half.alpha=qt(1-alpha/2,df=n-1)
> c(-t.half.alpha,t.half.alpha)
[1] -2.032245  2.032245
>
```

PRACTICAL NUMBER-7

Q) Import the data from Excel/.CSV file and perform the Chi-squared Test.

SOLUTION:-

```
> library(MASS)
> print(str(Cars93))
'data.frame':	93 obs. of  27 variables:
 $ Manufacturer      : Factor w/ 32 levels "Acura","Audi",..: 1 1 2 2 3 4 4 4 4 5 ...
 $ Model             : Factor w/ 93 levels "100","190E","240",..: 49 56 9 1 6 24 54 74 73 35 ...
 $ Type              : Factor w/ 6 levels "Compact","Large",..: 4 3 1 3 3 3 2 2 3 2 ...
 $ Min.Price         : num  12.9 29.2 25.9 30.8 23.7 14.2 19.9 22.6 26.3 33 ...
 $ Price             : num  15.9 33.9 29.1 37.7 30 15.7 20.8 23.7 26.3 34.7 ...
 $ Max.Price         : num  18.8 38.7 32.3 44.6 36.2 17.3 21.7 24.9 26.3 36.3 ...
 $ MPG.city          : int  25 18 20 19 22 22 19 16 19 16 ...
 $ MPG.highway       : int  31 25 26 26 30 31 28 25 27 25 ...
 $ AirBags           : Factor w/ 3 levels "Driver & Passenger",..: 3 1 2 1 2 2 2 2 2 2 ...
 $ DriveTrain        : Factor w/ 3 levels "4WD","Front",..: 2 2 2 2 3 2 2 3 2 2 ...
 $ Cylinders         : Factor w/ 6 levels "3","4","5","6",..: 2 4 4 4 2 2 4 4 4 5 ...
 $ EngineSize        : num  1.8 3.2 2.8 2.8 3.5 2.2 3.8 5.7 3.8 4.9 ...
 $ Horsepower        : int  140 200 172 172 208 110 170 180 170 200 ...
 $ RPM               : int  6300 5500 5500 5500 5700 5200 4800 4000 4800 4100 ...
 $ Rev.per.mile      : int  2890 2335 2280 2535 2545 2565 1570 1320 1690 1510 ...
 $ Man.trans.avail   : Factor w/ 2 levels "No","Yes": 2 2 2 2 2 1 1 1 1 1 ...
 $ Fuel.tank.capacity: num  13.2 18 16.9 21.1 21.1 16.4 18 23 18.8 18 ...
 $ Passengers        : int  5 5 5 6 4 6 6 6 5 6 ...
 $ Length            : int  177 195 180 193 186 189 200 216 198 206 ...
 $ Wheelbase         : int  102 115 102 106 109 105 111 116 108 114 ...
 $ Width             : int  68 71 67 70 69 69 74 78 73 73 ...
 $ Turn.circle       : int  37 38 37 37 39 41 42 45 41 43 ...
 $ Rear.seat.room    : num  26.5 30 28 31 27 28 30.5 30.5 26.5 35 ...
 $ Luggage.room      : int  11 15 14 17 13 16 17 21 14 18 ...
 $ Weight            : int  2705 3560 3375 3405 3640 2880 3470 4105 3495 3620 ...
 $ Origin            : Factor w/ 2 levels "USA","non-USA": 2 2 2 2 2 1 1 1 1 1 ...
 $ Make              : Factor w/ 93 levels "Acura Integra",..: 1 2 4 3 5 6 7 9 8 10 ...
NULL
> |
```

```
> car.data=table(Cars93$AirBags,Cars93$Type)
> print(car.data)

                     Compact Large Midsize Small Sporty Van
  Driver & Passenger       2     4       7     0      3   0
  Driver only              9     7      11     5      8   3
  None                     5     0       4    16      3   6
> print(chisq.test(car.data))

	Pearson's Chi-squared test

data:  car.data
X-squared = 33.001, df = 10, p-value = 0.0002723

Warning message:
In chisq.test(car.data) : Chi-squared approximation may be incorrect
> |
```

PRACTICAL NUMBER-8

Q) Using R perform the binomial and normal distribution on the data.

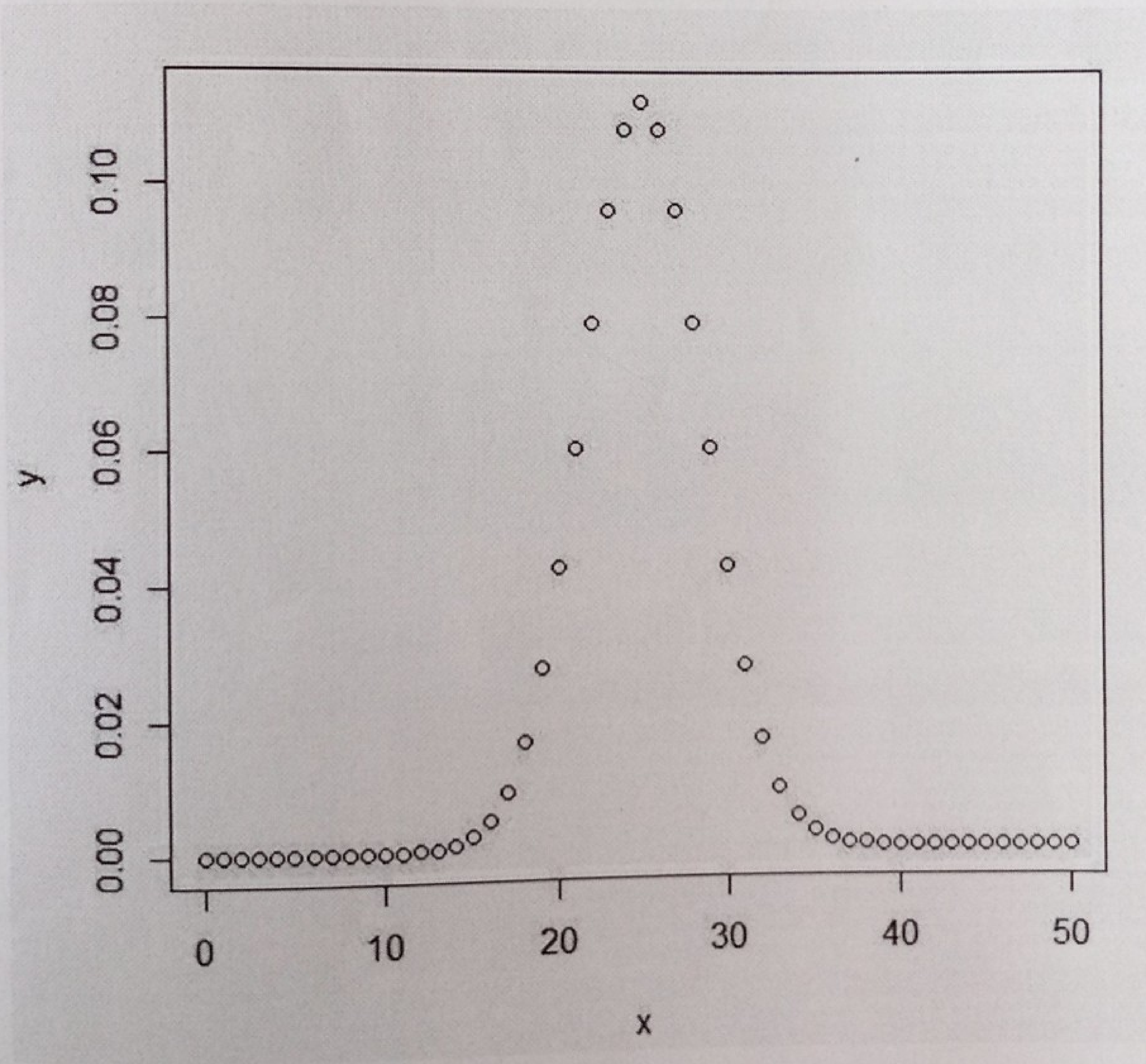
SOLUTION:-

1)Binomial Distribution

i)dbinom()

SOLUTION:-

```
> x<-seq(0,50,by=1)
> y<-dbinom(x,50,0.5)
> plot(x,y)
>
```



ii)pbinom()

SOLUTION:-

```
> x<-pbinom(26,51,0.5)
> print(x)
[1] 0.610116
> |
```

iii)qbinom()

SOLUTION:-

```
> x<-qbinom(0.25,51,1/2)
> print(x)
[1] 23
> |
```

iv)rbinom

SOLUTION:-

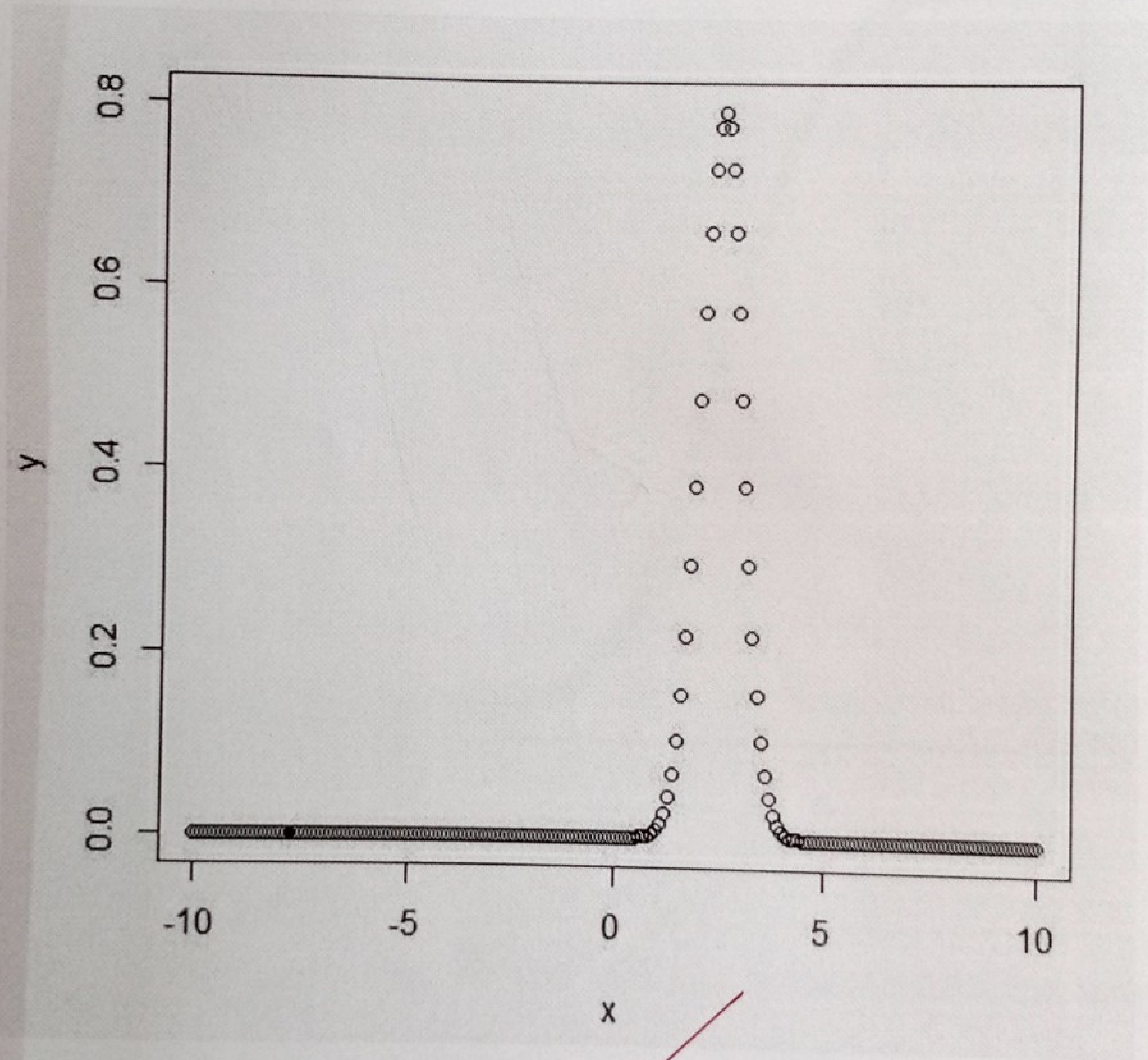
```
> x<-rbinom(8,150,0.4)
> print(x)
[1] 65 62 53 61 63 66 53 62
> |
```

2) Normal Distribution

i)dnorm

SOLUTION:-

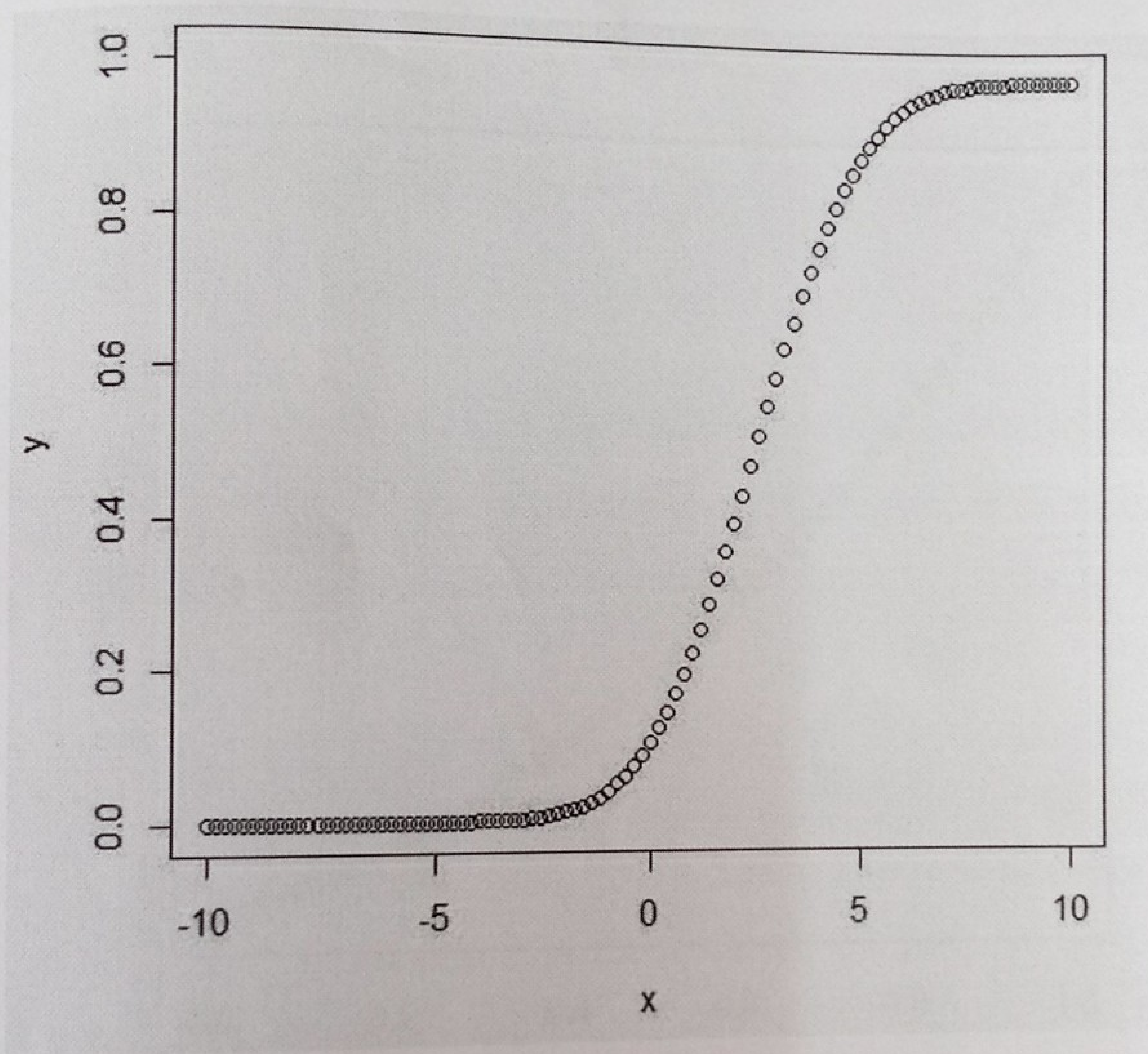
```
> x<-seq(-10,10,by=0.1)
> y<-dnorm(x,mean=2.5,sd=0.5)
> plot(x,y)
>
```



ii)pnorm

SOLUTION:-

```
> x<-seq(-10,10,by=0.2)
> y<-pnorm(x,mean=2.5,sd=2)
> plot(x,y)
>
```



iv)rnorm

SOLUTION:-

```
> y<-rnorm(50)
> hist(y,main="Normal Distribution")
>
```