ASSIGNMENT 7

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Sub-group : CS7

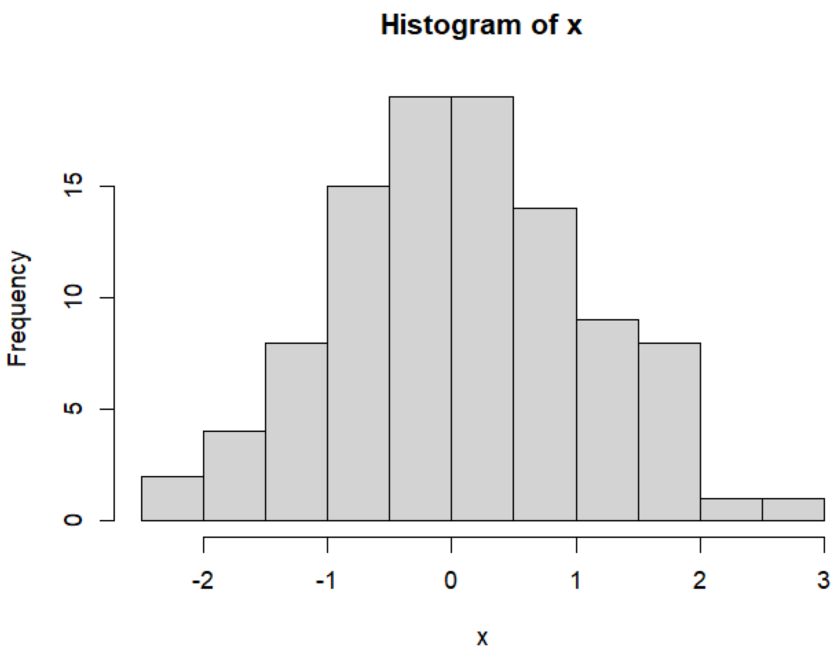
Q1. Use the rt(n, df) function in r to investigate the t-distribution for n = 100 and df = n – 1 and plot the histogram for the same.

CODE:

```
#Q1
n=100
df=n-1
x=rt(n,df)
print(x)
hist(x)
```

OUTPUT:

```
> #Q1
> n=100
> df=n-1
> x=rt(n,df)
> print(x)
  [1] -0.03307709  0.56689382 -1.54221600  0.93786094  0.49063073  0.13775669 -0.04080944  0.26895612  0.63195067 -0.65626849
 [11]  1.87788889  1.25869642  0.34774190 -1.00267395 -0.15026311  0.86971292 -0.13450537 -0.19392538 -0.22862419  1.40720613
 [21] -0.76969232  0.01879967 -0.48062112  0.49257059  1.38172548  1.14742689  0.91481912 -0.44789089 -0.94713541  0.06669821
 [31] -0.55873619  2.29035024 -0.90725807 -1.03142090 -0.71614241 -1.52895894  0.03193011 -0.18224433  0.36848108  1.20497227
 [41] -0.24553423 -0.41359538  1.60369526 -0.64489797  0.13195038 -0.40897886 -0.41067075  1.76249943  1.71638637  0.23751598
 [51]  0.98664483  0.46208830  0.94160985  1.61905118 -0.77619595 -1.01699947  0.88241670  0.13217070 -0.04592984 -1.98571702
 [61]  0.34932128  0.82359575  1.72402551 -1.23969241  1.10373364  2.59642660 -0.66611073  0.80980064 -2.37198244 -0.31367670
 [71] -0.66093557 -1.36409902 -0.61609420 -0.91833165  0.42873526  0.54241368 -0.84202726 -0.03085812 -1.29475642 -0.50404506
 [81] -1.19468596  1.92080549  1.30860089 -0.11504381  0.25240793  0.23860629  0.52369981 -2.01110403  0.81058668 -0.19201665
 [91] -0.65719506  0.21004339  1.06689976  0.06932605 -1.08809646 -1.54012052  1.28438154  1.57319569  0.70150823 -0.05355494
> hist(x)
```



Q2. Use the rchisq(n, df) function in r to investigate the chi-square distribution with n = 100 and

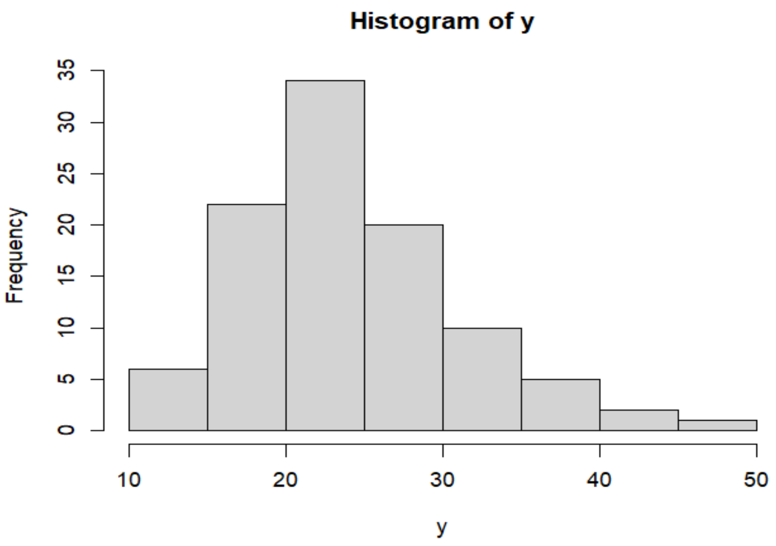
df = 2, 10, 25.

CODE:

```r
#Q2
n=100
df=c(2,10,25)
for(i in 1:3){
  y=rchisq(n,df[i])
  print(y)
}
hist(y)
```

OUTPUT:

```
> #Q2
> n=100
> df=c(2,10,25)
> for(i in 1:3){
+   y=rchisq(n,df[i])
+   print(y)
+ }
  [1] 2.19991569 0.39610071 0.64879626 1.44599263 0.83600201 1.18728052 1.37244655 1.84172496 1.29830646 0.40965339 1.68963422
 [12] 0.69088391 2.68003839 1.56148341 0.50944278 2.09544905 3.84819375 1.52616007 0.03588157 0.63684612 3.69608279 0.14022928
 [23] 1.63189933 2.71803928 0.91933632 5.17828309 1.11150642 2.79781764 3.29584606 0.28501353 0.50773271 1.23381151 1.48862672
 [34] 1.37783846 9.14896166 2.42782321 2.17779246 1.73478385 1.27120182 1.68920998 1.79192771 1.14502634 0.85606593 1.29548944
 [45] 6.02778949 3.17525940 4.13825256 1.19061538 0.15506726 1.78616108 1.75825925 6.85145956 2.43875628 1.54004383 0.98567314
 [56] 1.79855826 0.64687705 0.94016266 0.27506466 0.82286083 1.61966456 0.43899250 0.37379353 3.77073930 2.91874581 1.18811609
 [67] 0.47374247 0.24262656 0.90079544 2.41432224 0.06659692 0.04884039 4.57471655 0.52280886 2.61469715 0.02470940 3.87271043
 [78] 0.24410180 0.30191173 0.18408275 1.43850565 1.73868713 2.10545186 1.20868555 1.33864456 0.88532769 2.29808650 0.69356915
 [89] 0.07945049 0.73282834 0.36541817 0.16893937 3.62712221 0.72743735 7.07282083 0.51452356 0.51769402 0.61574850 3.82331955
[100] 0.36534377
  [1]  8.812249  6.098725 12.915700  4.238435  8.139742 11.293440 10.091234 10.566814 11.388994  6.814420  5.751172  5.637893
 [13] 13.923278 10.682846 12.410898  3.676213  8.357955 11.091991 16.645857 12.109633 13.710158  6.543769 13.081735  8.046165
 [25] 13.599426 10.913068  6.736796  5.036816  6.885402  2.996420 10.518311  7.543625  9.855977 15.987002  9.677683 11.033616
 [37]  5.017287  7.634126 14.164633 10.652373 17.822970 11.518487  2.857405  4.438146  7.579731  3.657797  7.938406 10.870114
 [49] 17.960935  2.941217 10.124333  9.208339  7.798523  6.790017 10.273302  9.523162 11.065168 23.604814  6.501316 16.413177
 [61] 12.089575  6.055162  7.983475 14.348610  7.371417 13.222526 10.220412 16.484673 10.783451  5.332775  6.001731  8.125392
 [73]  5.519215  7.440576 10.194555 12.583789 12.661196 13.079893  7.544035 11.466430  4.698488  4.728660 14.343419 13.568905
 [85]  8.073840 13.239525  9.685034  5.435914  5.810403  6.404347  8.700782  7.593370 11.765961 12.097514  7.833703 11.586164
 [97]  7.853691  5.486127  9.223059 11.981160
  [1] 23.88192 35.70204 15.04981 32.45878 23.79152 21.64329 17.87815 14.29030 23.95963 31.22270 16.19558 28.64891 28.08909 23.44734
 [15] 20.56241 30.23103 28.52635 21.75947 32.64121 23.49134 15.75951 24.14214 16.69698 23.17419 19.51821 28.83865 32.05509 20.72643
 [29] 27.26687 21.17432 32.38470 32.64164 21.44430 17.57252 16.93183 28.60272 36.29525 37.02704 15.16621 23.38017 25.10225 16.47499
 [43] 27.84204 14.57324 30.46582 19.32950 20.96662 25.97372 21.66139 20.62346 23.32796 25.70536 12.27092 25.19611 28.77156 32.22838
 [57] 25.90629 33.85541 13.31842 24.10421 17.54797 31.39610 21.45643 24.37073 23.97699 18.63563 40.27294 16.18577 27.78181 22.18418
 [71] 38.05071 27.48480 41.84480 21.56470 26.44146 18.33952 27.05915 25.34499 27.35373 16.02269 33.57635 23.66247 29.50360 31.11556
 [85] 17.47295 21.33140 43.14221 28.18659 17.86478 21.34437 19.52083 13.15812 22.95854 19.46870 14.70020 23.14196 24.99002 24.43915
 [99] 24.14636 28.29559
> hist(y)
```

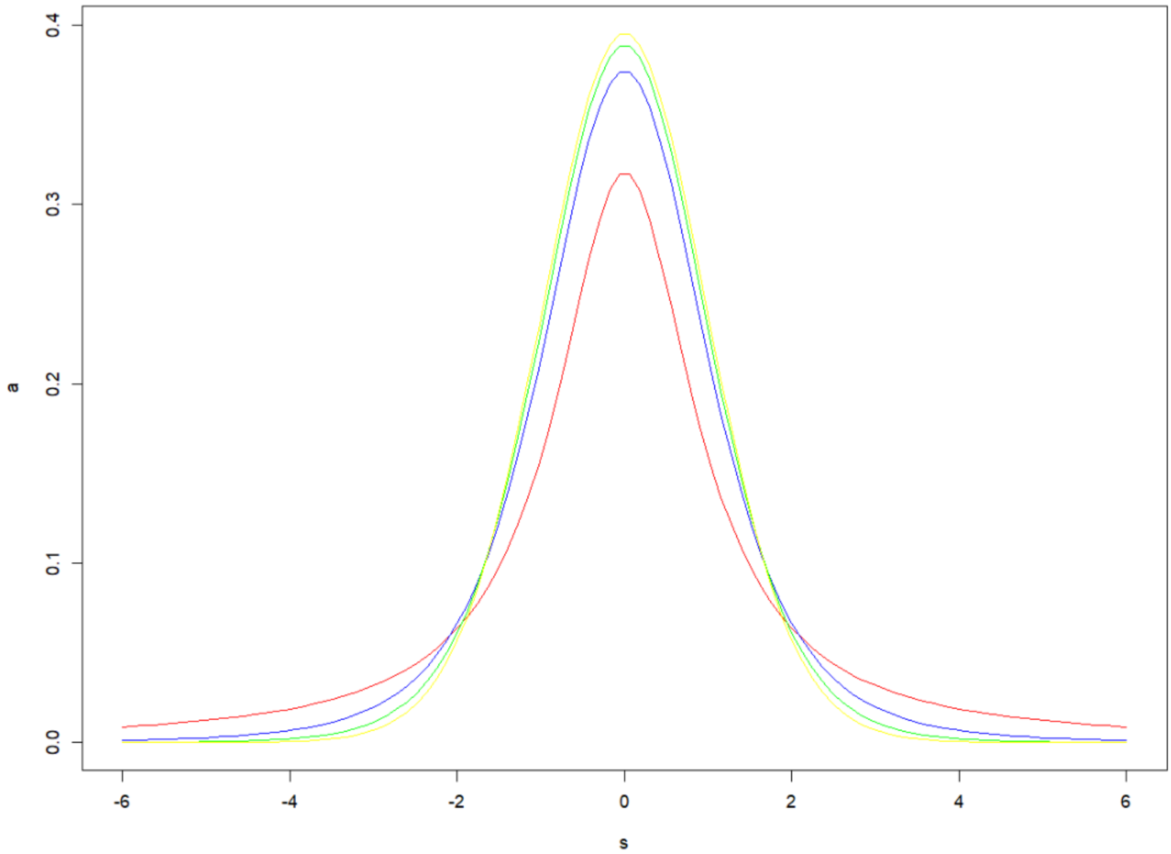


Q3. Generate a vector of 100 values between -6 and 6. Use the dt() function in r to find the values of a t-distribution given a random variable x and degrees of freedom 1,4,10,30. Using these values plot the density function for students t-distribution with degrees of freedom 30. Also shows a comparison of probability density functions having different degrees of freedom (1,4,10,30).

CODE:

```
#Q3
s=seq(-6,6,length=100)
df=c(1,4,10,30)
colour<-c("red","blue","green","yellow")
plot(s,a,type="l",col=colour[1])
for(i in 1:4){
  a<-dt(s,df[i])
  lines(s,a,type="l",col=colour[i])
}
```

OUTPUT:



Q4. Write a r-code

(i) To find the 95th percentile of the F-distribution with (10, 20) degrees of freedom.

CODE:

```
#(i)
x=qf(0.95,df1=10,df2=20)
x
```

OUTPUT:

```
> #(i)
> x=qf(0.95,df1=10,df2=20)
> x
[1] 2.347878
```

(ii) To calculate the area under the curve for the interval [0, 1.5] and the interval [1.5, +∞) of a F-curve with v1 = 10 and v2 = 20 (USE pf()).

CODE:

```
#(ii)
m=1.5
pf(m,df1=10,df2=20,lower.tail = FALSE)
pf(m,df1=10,df2=20,lower.tail = TRUE)
```

OUTPUT:

```
> #(ii)
> m=1.5
> pf(m,df1=10,df2=20,lower.tail = FALSE)
[1] 0.2109465
> pf(m,df1=10,df2=20,lower.tail = TRUE)
[1] 0.7890535
```

(iii) To calculate the quantile for a given area (= probability) under the curve for a F-curve with v1 = 10 and v2 = 20 that corresponds to q = 0.25, 0.5, 0.75 and 0.999. (use the qf())

CODE:

```
#(iii)
q=c(0.25,0.5,0.75,0.999)
for(i in 1:4){
  p=qf(q[i],df1=10,df2=20)
  print(p)
}
```

OUTPUT:

```
> #(iii)
> q=c(0.25,0.5,0.75,0.999)
> for(i in 1:4){
+   p=qf(q[i],df1=10,df2=20)
+   print(p)
+ }
[1] 0.6563936
[1] 0.9662639
[1] 1.399487
[1] 5.075246
```

(iv) To generate 1000 random values from the F-distribution with v1 = 10 and v2 = 20 (use rf())and plot a histogram.

CODE:

```
#(iv)
r=rf(1000,10,20)
hist(r)
```

OUTPUT: