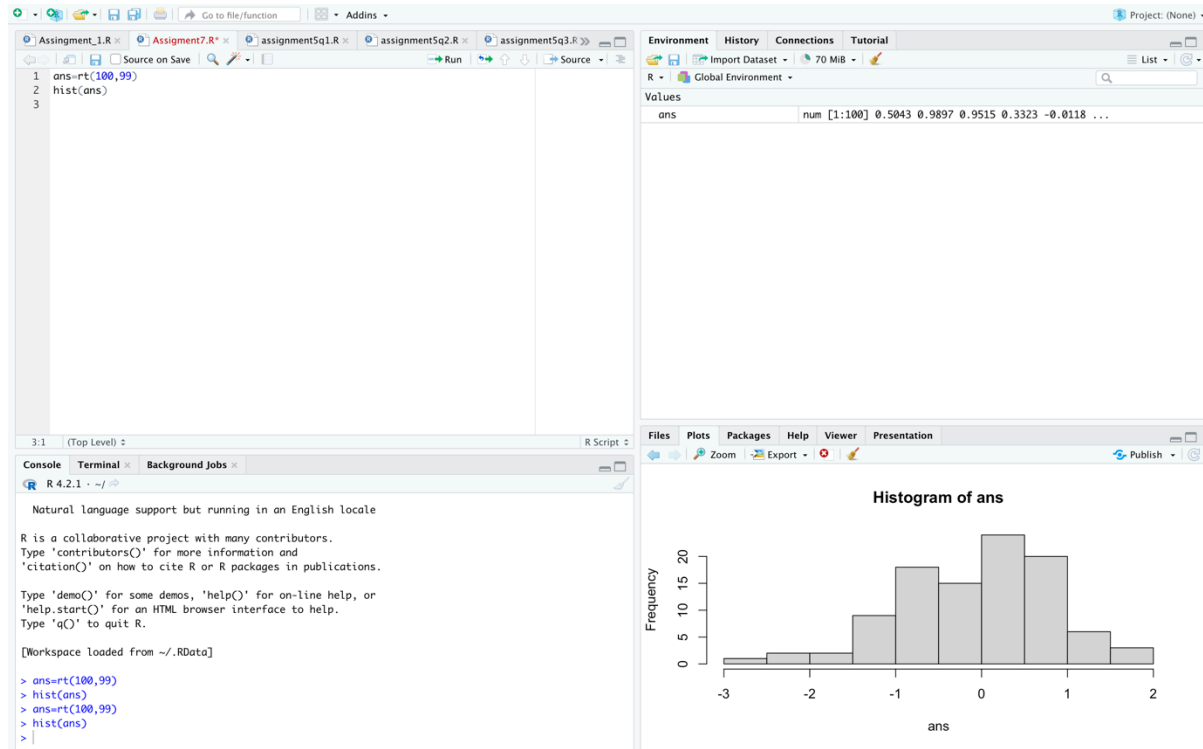


Assignment 7
Name: Suyash Kumar Sherwal
Roll No : 102003067
Class : 3COE1

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.



Q2. Use the `rchisq(n, df)` function in `r` to investigate the chi-square distribution with $n = 100$ and $df = 2, 10, 25$.

The screenshot shows the RStudio environment with the following components:

- Source Editor:** Contains three lines of R code:

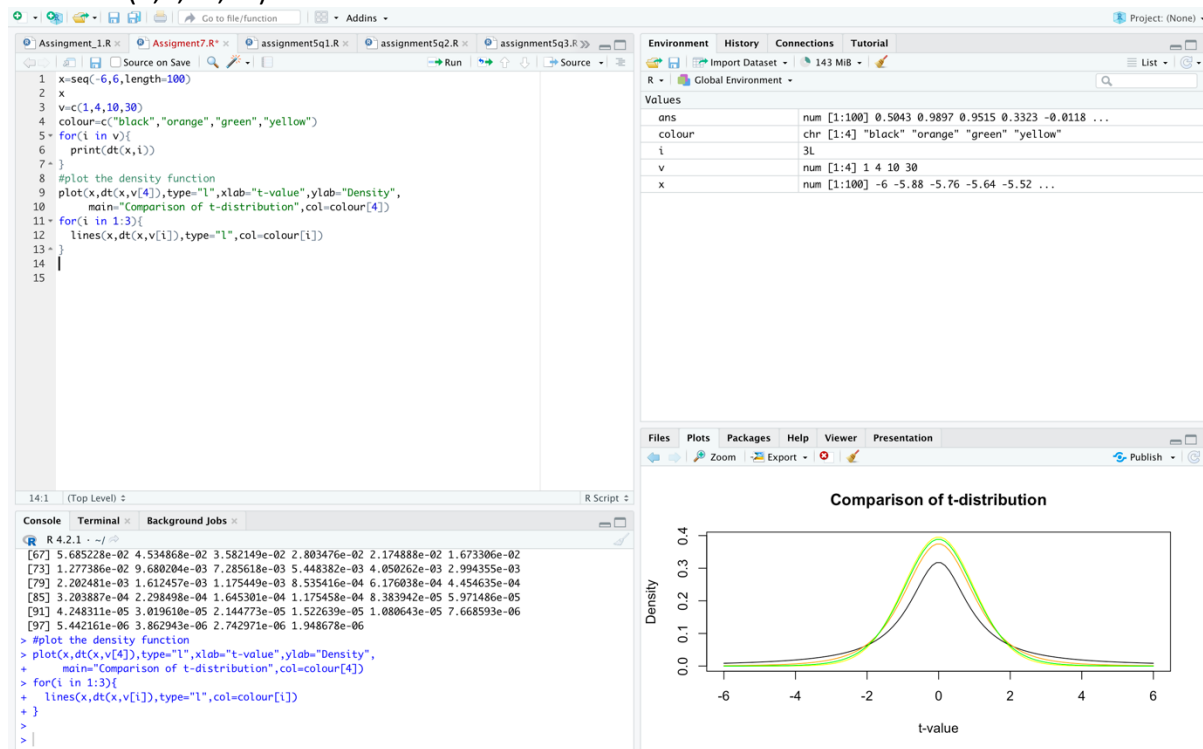

```
1 rchisq(100,2)
2 rchisq(100,10)
3 rchisq(100,25)
```
- Console:** Displays the output of the executed code. It shows three large blocks of random numbers generated by `rchisq(100, 2)`, `rchisq(100, 10)`, and `rchisq(100, 25)`. Each block starts with an index in brackets (e.g., [1], [8], [15], etc.) and contains a single numerical value.

 The first block for `rchisq(100, 2)` contains 100 values, with the last one being 1.21188886.

 The second block for `rchisq(100, 10)` contains 100 values, with the last one being 14.394024.

 The third block for `rchisq(100, 25)` contains 100 values, with the last one being 19.66030.

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 student's t-distribution with degrees of freedom 30. Also shows a comparison of probability density functions having different degrees of freedom (1,4,10,30).



Q4. (i) (i) To find the 95th percentile of the F-distribution with (10, 20) degrees of freedom.

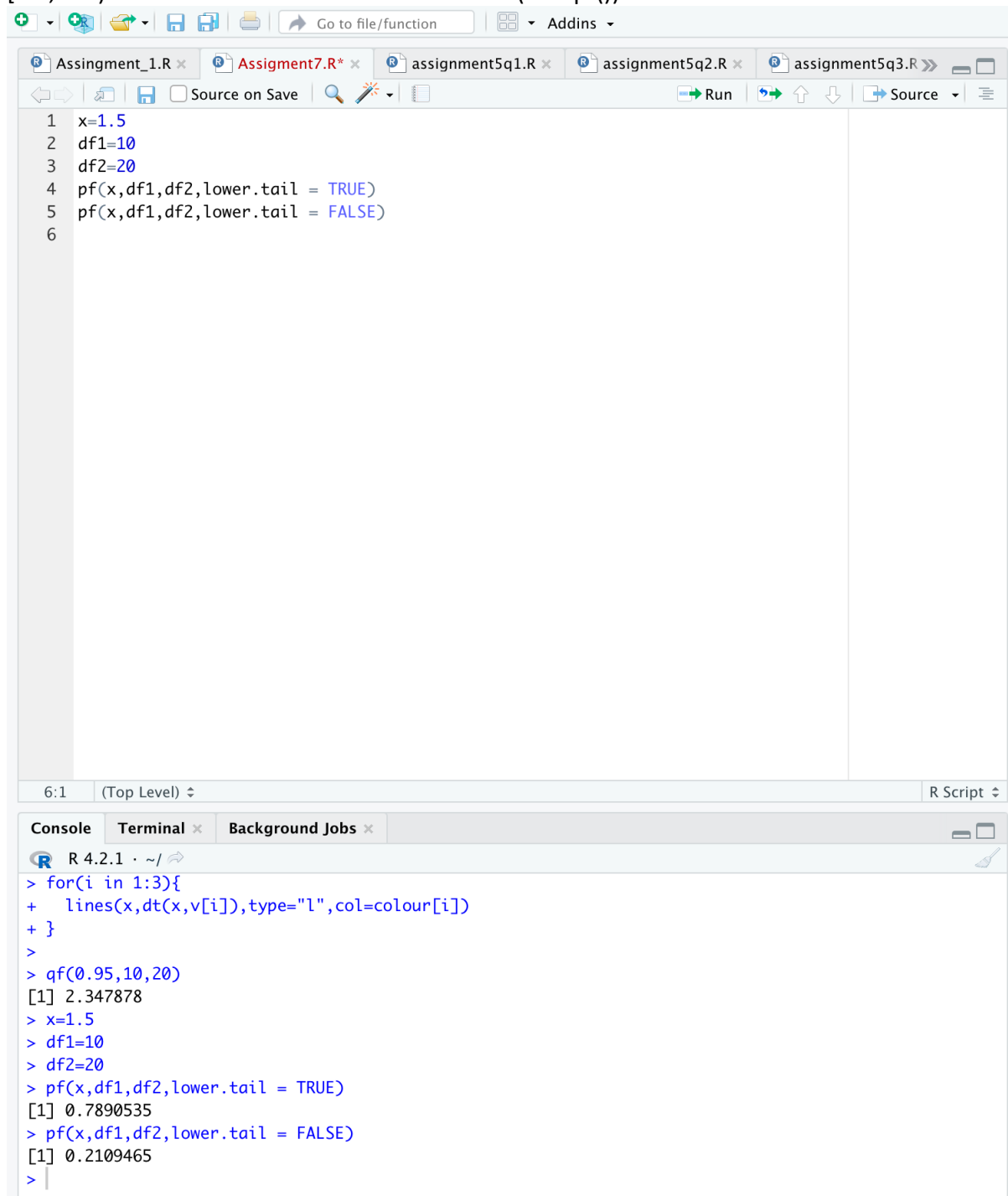
The screenshot displays the RStudio environment. The top toolbar includes icons for file operations and a 'Go to file/function' search bar. The tab bar shows several open files, with 'Assignment7.R*' currently active. The script editor contains the following code:

```
1 qf(0.95,10,20)
2 |
```

The status bar at the bottom indicates '2:1 (Top Level)' and 'R Script'. Below the script editor is the 'Console' window, which shows the output of the R session:

```
R 4.2.1 ~/  
[79] 2.202481e-03 1.612457e-03 1.175449e-03 8.535416e-04 6.176038e-04 4.454635e-04  
[85] 3.203887e-04 2.298498e-04 1.645301e-04 1.175458e-04 8.383942e-05 5.971486e-05  
[91] 4.248311e-05 3.019610e-05 2.144773e-05 1.522639e-05 1.080643e-05 7.668593e-06  
[97] 5.442161e-06 3.862943e-06 2.742971e-06 1.948678e-06  
> #plot the density function  
> plot(x,dt(x,v[4]),type="l",xlab="t-value",ylab="Density",  
+      main="Comparison of t-distribution",col=colour[4])  
> for(i in 1:3){  
+   lines(x,dt(x,v[i]),type="l",col=colour[i])  
+ }  
>  
> qf(0.95,10,20)  
[1] 2.347878  
> |
```

Q4. (ii) (ii) To calculate the area under the curve for the interval $[0, 1.5]$ and the interval $[1.5, +\infty)$ of a F-curve with $v_1 = 10$ and $v_2 = 20$ (USE `pf()`).



The screenshot displays the RStudio environment. The top toolbar includes icons for file operations and a 'Go to file/function' search bar. The editor pane shows a script with the following R code:

```
1 x=1.5
2 df1=10
3 df2=20
4 pf(x,df1,df2,lower.tail = TRUE)
5 pf(x,df1,df2,lower.tail = FALSE)
6
```

The bottom pane is divided into 'Console', 'Terminal', and 'Background Jobs' tabs. The 'Console' tab is active, showing the output of the executed code:

```
R 4.2.1 ~/  
> for(i in 1:3){  
+   lines(x,dt(x,v[i]),type="l",col=colour[i])  
+ }  
>  
> qf(0.95,10,20)  
[1] 2.347878  
> x=1.5  
> df1=10  
> df2=20  
> pf(x,df1,df2,lower.tail = TRUE)  
[1] 0.7890535  
> pf(x,df1,df2,lower.tail = FALSE)  
[1] 0.2109465  
>
```

Q4. (iii) To calculate the quantile for a given area (= probability) under the curve for a F-curve with $v_1 = 10$ and $v_2 = 20$ that corresponds to $q = 0.25, 0.5, 0.75$ and 0.999 . (use the `qf()`)



The screenshot shows the R Studio environment. The script editor contains the following code:

```
1 q=c(0.25,0.5,0.75,0.999)
2 df1=10
3 df2=20
4 for(i in q){
5   print(qf(i,df1,df2))
6 }
7 |
8
```

The console output shows the execution of the script:

```
R 4.2.1 ~/  
> pf(x,df1,df2,lower.tail = FALSE)  
[1] 0.2109465  
> q=c(0.25,0.5,0.75,0.999)  
> df1=10  
> df2=20  
> for(i in q){  
+   print(qf(i,df1,df2))  
+ }  
[1] 0.6563936  
[1] 0.9662639  
[1] 1.399487  
[1] 5.075246  
>  
> |
```

Q4. (iv) To generate 1000 random values from the F-distribution with $v_1 = 10$ and $v_2 = 20$ (use `rf()`) and plot a histogram.

