



GALGOTIAS UNIVERSITY

PLOT NO.2, SECTOR – 17 A, YAMUNA EXPRESSWAY,
GREATER NOIDA, GAUTAM BUDH NAGAR, U.P INDIA

SCHOOL OF COMPUTING SCIENCE AND ENGINEERING

SUBJECT :SCI LAB

PROGRAMME :B.Tech

Subject code : BCS01T1001

Semester :1st

Submitted to :

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Submitted By :

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Section : 24 (P1)

S. No.	List of Experiments
1.	Overview, Basic syntax, Mathematical Operators, Predefined constants, Built in functions at SCILAB platform.
2.	Write a SCILAB code to find addition, subtraction, multiplication and division of two matrices, transpose of a matrix and inverse of a non singular matrix.
3.	Write a SCILAB code for programming -Functions - Loops - Conditional statements - Handling .sci files.
4.	Write a SCILAB code for 2-D : circle, parabola, ellipse and hyperbola and 3-D surfaces: Plane, Sphere, Cylinder, Paraboloid, Ellipsoid, Hyperboloid, cone.
5.	Write a SCILAB code to find expansion of functions in Taylor series.
6.	Write a SCILAB code for Fourier series expansion of different wave forms and comparison with the original function.

EXPERIMENT - 1

1. Compute:

(i) $7+8/2$

(ii) $(7+8)/2$

(iii) $($

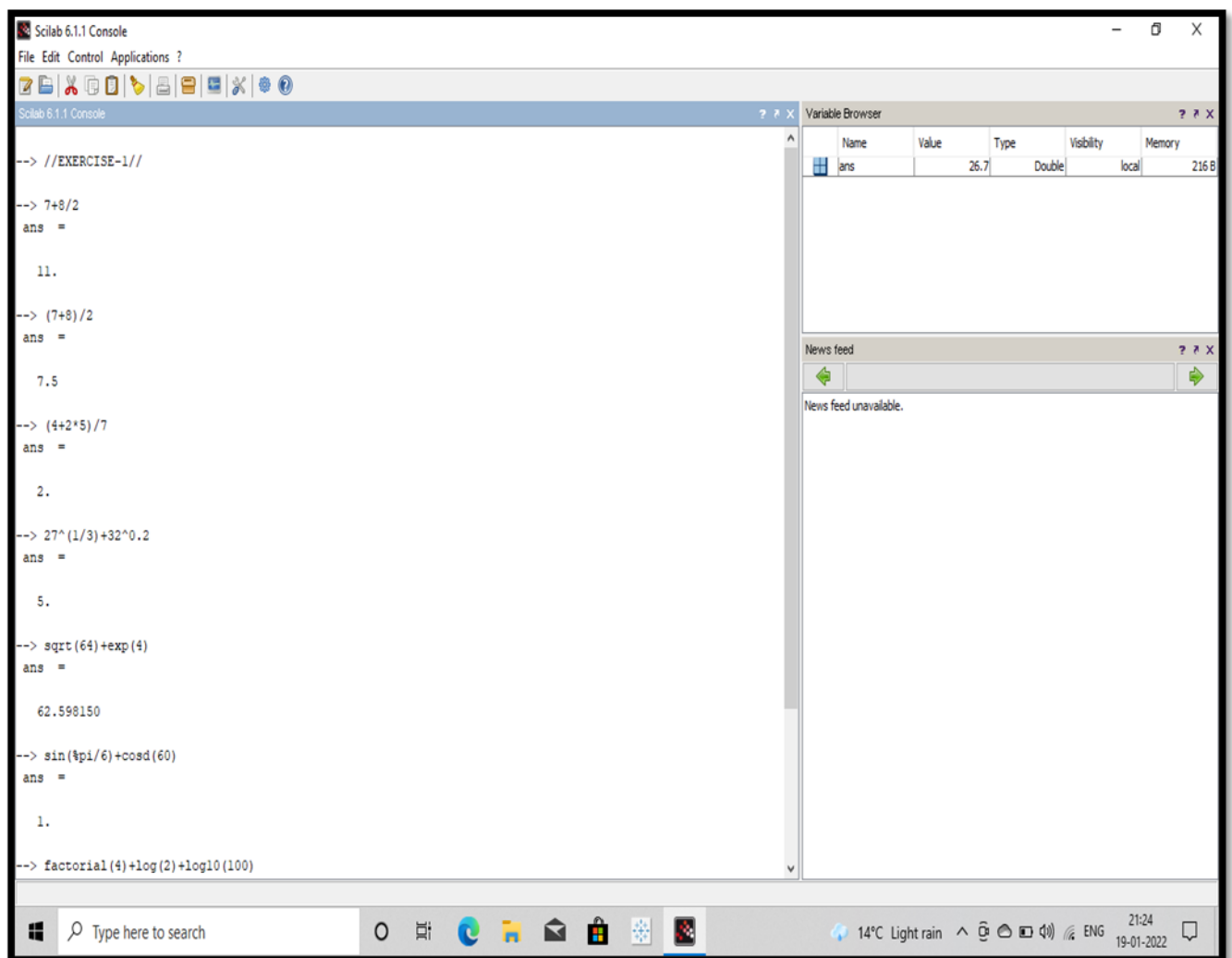
$4+2 \times 5)/7$

2. Evaluate:

(i) $27^{1/3} + 32^{0.2}$

(ii) $\sqrt{64} + e^4$

(iii) $\sin \pi/6 + \cos 60$



(iv) $4! + \ln 2 + \log 100$

(v) $(2+3i)(4+5i)$

Scilab 6.1.1 Console

File Edit Control Applications ?

Scilab 6.1.1 Console

```
--> factorial(4)+log(2)+log10(100)
ans =

    26.693147

--> (2+3*i)*(4+5*i)
ans =

    -7. + 22.i

--> a=2;
--> b=5;
```

Variable Browser

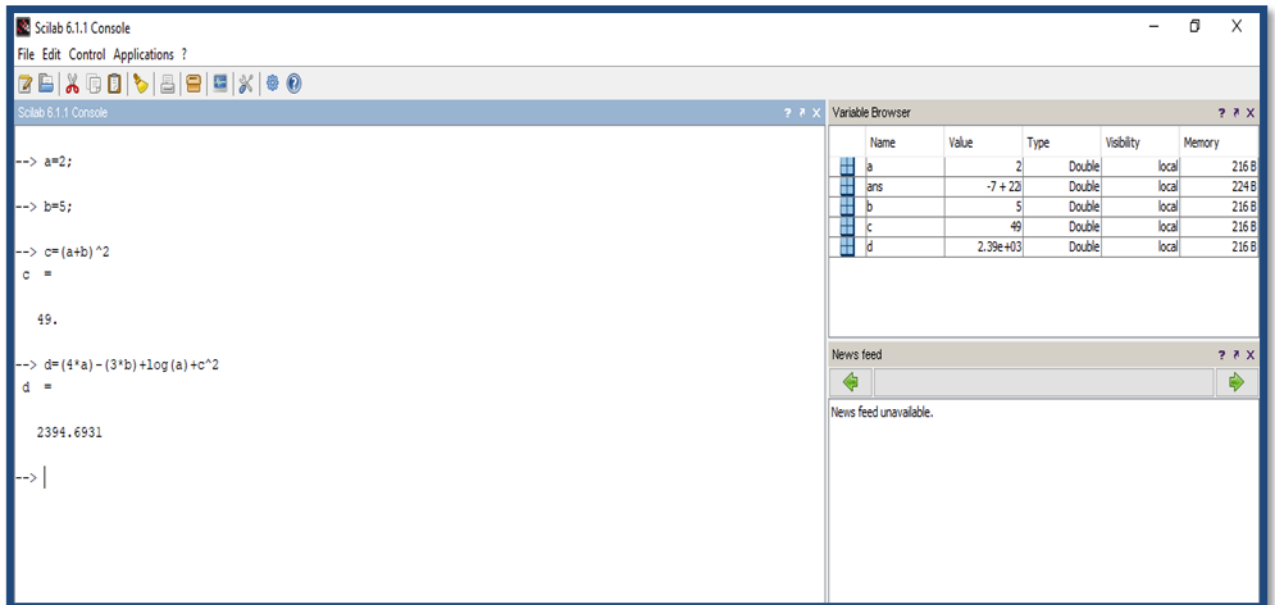
Name	Value	Type	Visibility	Memory
a	2	Double	local	216 B
ans	-7 + 22i	Double	local	224 B
b	5	Double	local	216 B
c	49	Double	local	216 B
d	4	Double	local	216 B

News feed

News feed unavailable.

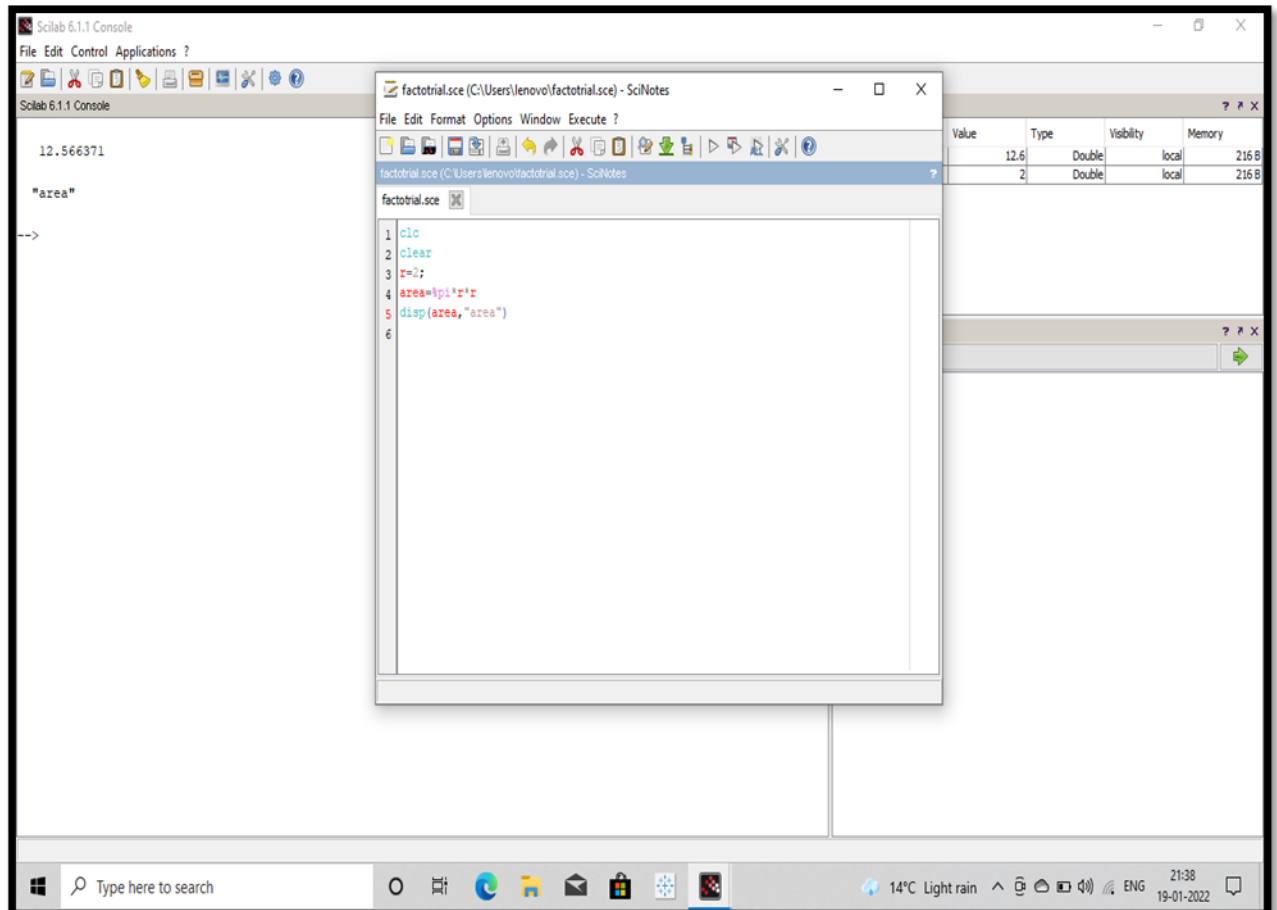
2. By assigning values 2 and 5 to variables a and b respectively, compute

(i) $c=(a+b)^2$ (ii) $d=4a-3b+\ln a+ c^2$



3. Write the script file for the problem:

The radius of a circle is 2cm. Find its area.



EXERCISE 2

To write a Scilab code to find the solution of following problems:

1. (i) create a row vector with 3 elements.

(ii) create a column vector with 4 elements

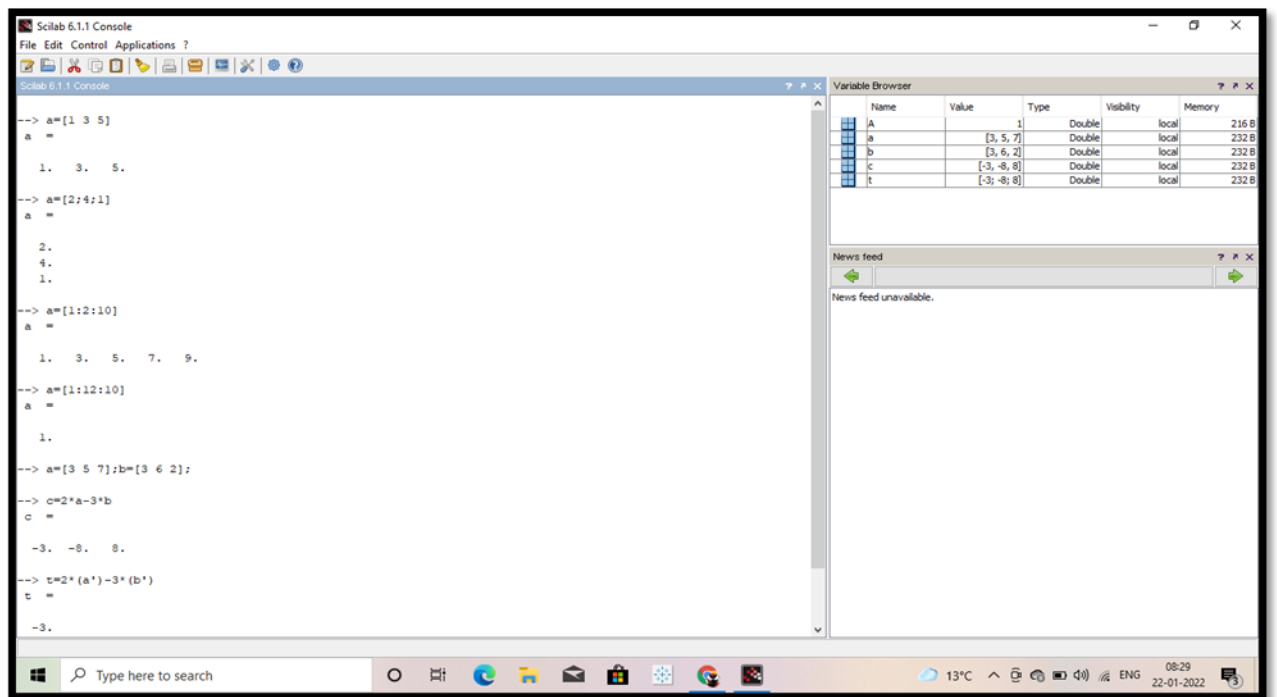
2. By taking first term $a=1$ and the last term $b=10$ create a one dimensional array :

(i) by taking the spacing between two consecutive terms $d=2$,

(ii) by taking the number of terms $n= 12$

3. Create two row vectors (1dimensional arrays) a and b such that the following operations are defined and hence find :

(i) $2a-3b$, (ii) $2(\text{transpose } a)-3(\text{transpose } b)$



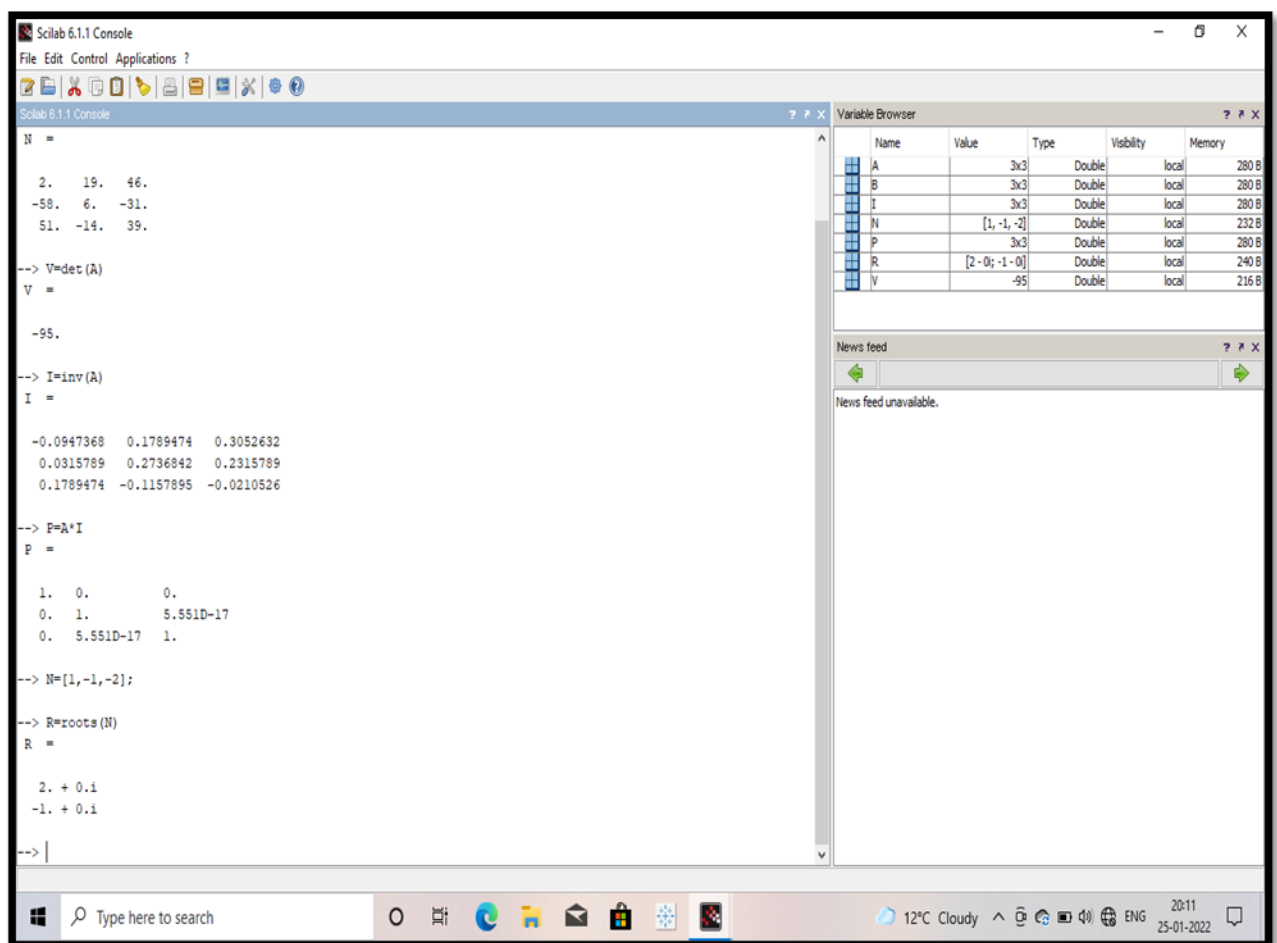
4. Create two matrices(two dimensional arrays)A and B such that the following operations are defined and hence :

(i) $3A-AB^2$

5. Create a matrix A so that the following operations are defined and find:

(i) determinant of A, (ii) Inverse of A, (iii) product of A and inverse of A

6. Find the root :- $x^2 - x - 2 = 0$



The screenshot shows the Scilab 6.1.1 Console window with the following code and output:

```
N =  
2. 19. 46.  
-58. 6. -31.  
51. -14. 39.  
--> V=det(A)  
V =  
-95.  
--> I=inv(A)  
I =  
-0.0947368 0.1789474 0.3052632  
0.0315789 0.2736842 0.2315789  
0.1789474 -0.1157895 -0.0210526  
--> P=A*I  
P =  
1. 0. 0.  
0. 1. 5.551D-17  
0. 5.551D-17 1.  
--> N=[1,-1,-2];  
--> R=roots(N)  
R =  
2. + 0.1  
-1. + 0.1  
--> |
```

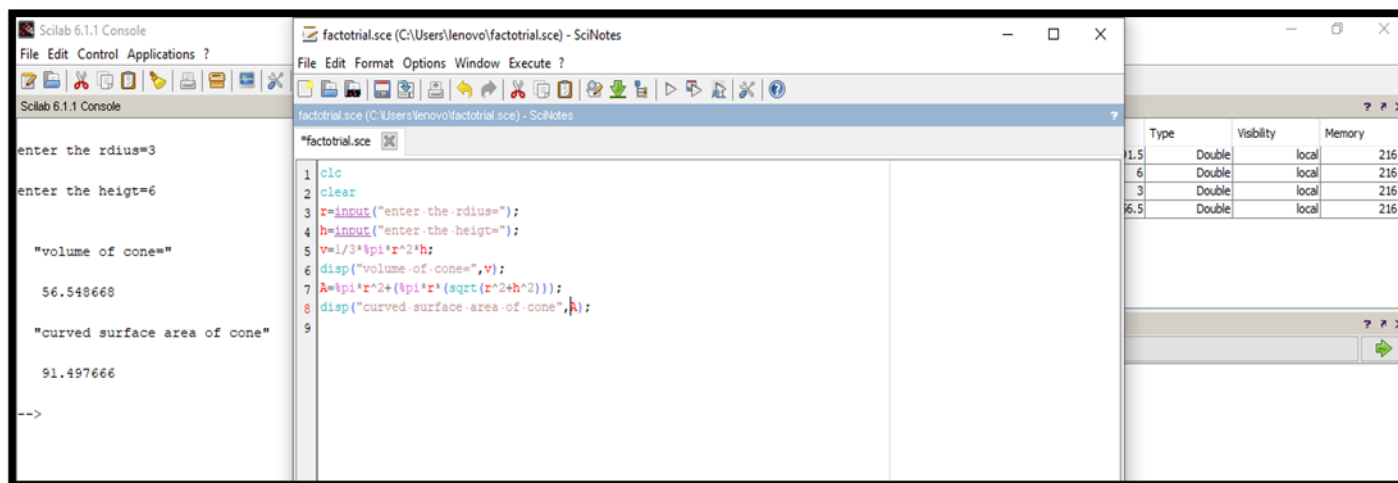
The Variable Browser on the right shows the following variables:

Name	Value	Type	Visibility	Memory
A		3x3 Double	local	280 B
B		3x3 Double	local	280 B
I		3x3 Double	local	280 B
N	[1, -1, -2]	Double	local	232 B
P		3x3 Double	local	280 B
R	[2 - 0i; -1 - 0i]	Double	local	240 B
V	-95	Double	local	216 B

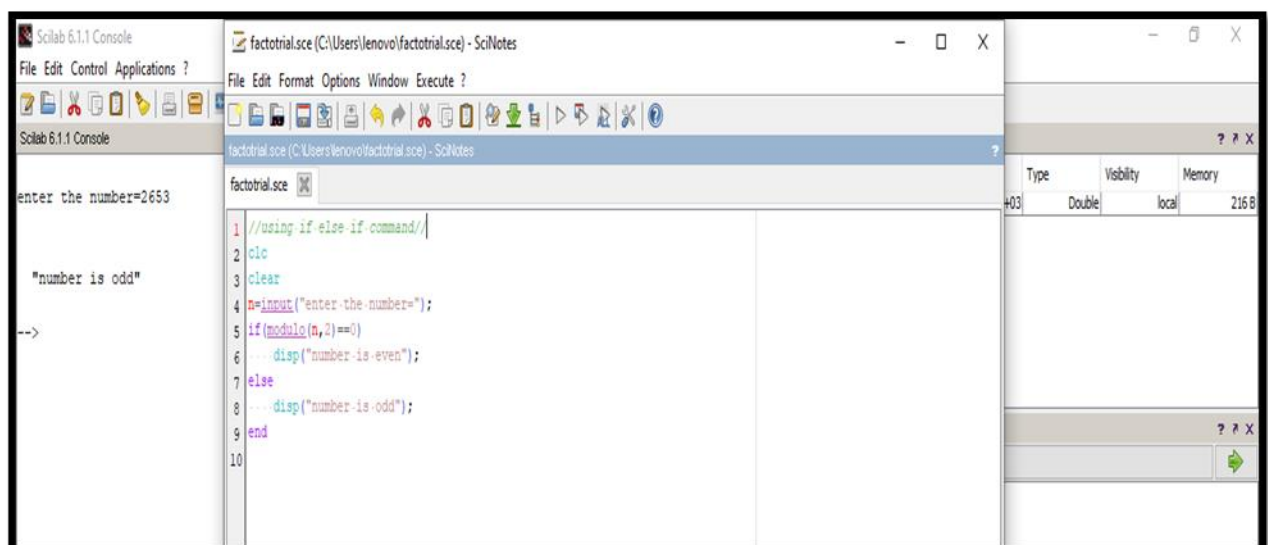
The News feed section shows "News feed unavailable."

EXERCISE 3

1. To find volume and curve surface area of cone using input function.



2. To find whether an integer entered by user is odd or even, using if- else-end command



3. To find whether a real number entered by user is negative, zero or a positive using if- elseif-else-end command

The screenshot shows the Scilab 6.1.1 interface. On the left is the 'Scilab 6.1.1 Console' window, and on the right is the 'factotrial.sce (C:\Users\lenovo\factotrial.sce) - SciNotes' editor window.

Scilab 6.1.1 Console:

```
enter the number=647  
  
"number is positive"  
-->
```

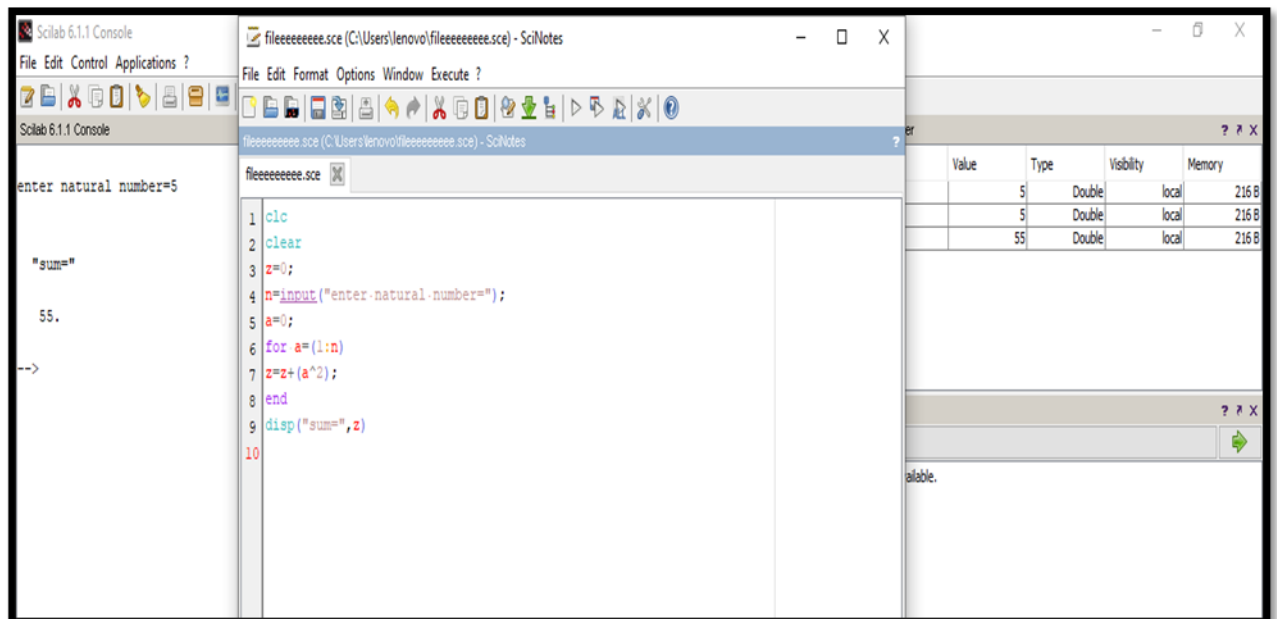
factotrial.sce (C:\Users\lenovo\factotrial.sce) - SciNotes:

```
1 //using if-elseif-else-end command//  
2 clc  
3 clear  
4 n=input("enter the number=");  
5 if(n>0)  
6 ... disp("number is positive");  
7 elseif(n<0)  
8 ... disp("number is negative");  
9 else  
10 ... disp("number is zero");  
11 end  
12
```

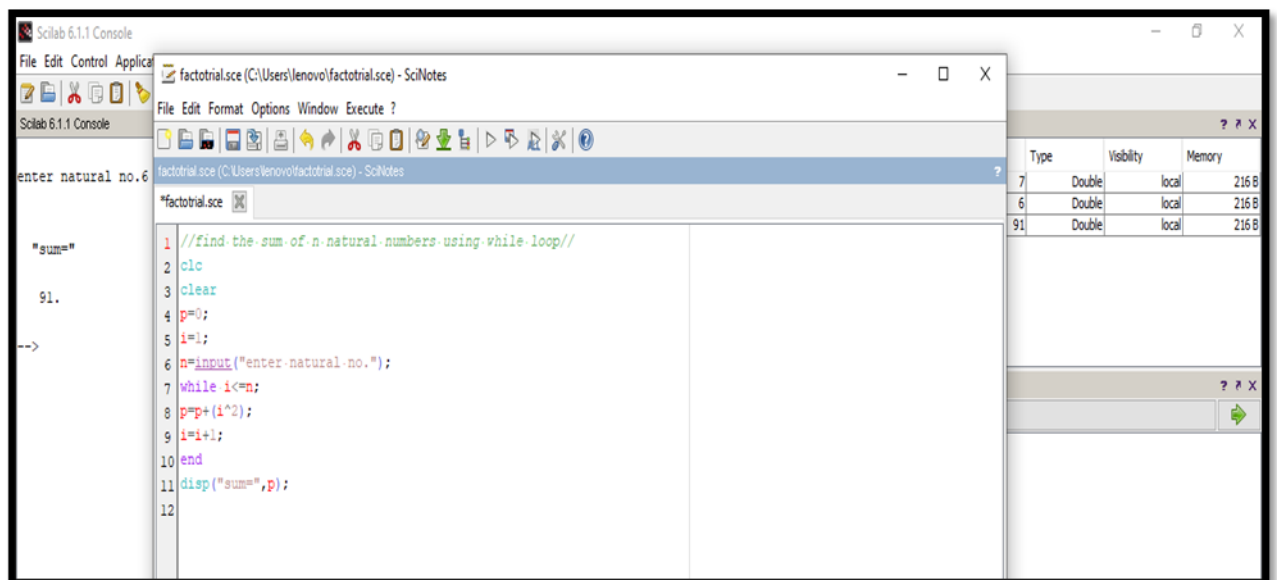
On the far right, a variable browser table is visible:

Type	Visibility	Memory
647	Double	local 216 B

4. To find the sum of first n natural numbers using for loop



5. To find the sum of first n natural numbers, using while loop.



6. To find factorial of a number using for loop

The screenshot shows the Scilab 6.1.1 interface. The console on the left displays the input "Enter the number: 6" and the output "Factorial= 720.". The central editor window shows the following code:

```
1 clc
2 clear
3 n=input("Enter the number: ")
4 f=1
5 for (i=1:n)
6     f=f*i;
7 end
8 disp("Factorial=",f)
9
```

On the right, a variable list table is visible:

Value	Type	Visibility	Memory
720	Double	local	216 B
6	Double	local	216 B
6	Double	local	216 B

7. To find factorial of a number using while loop

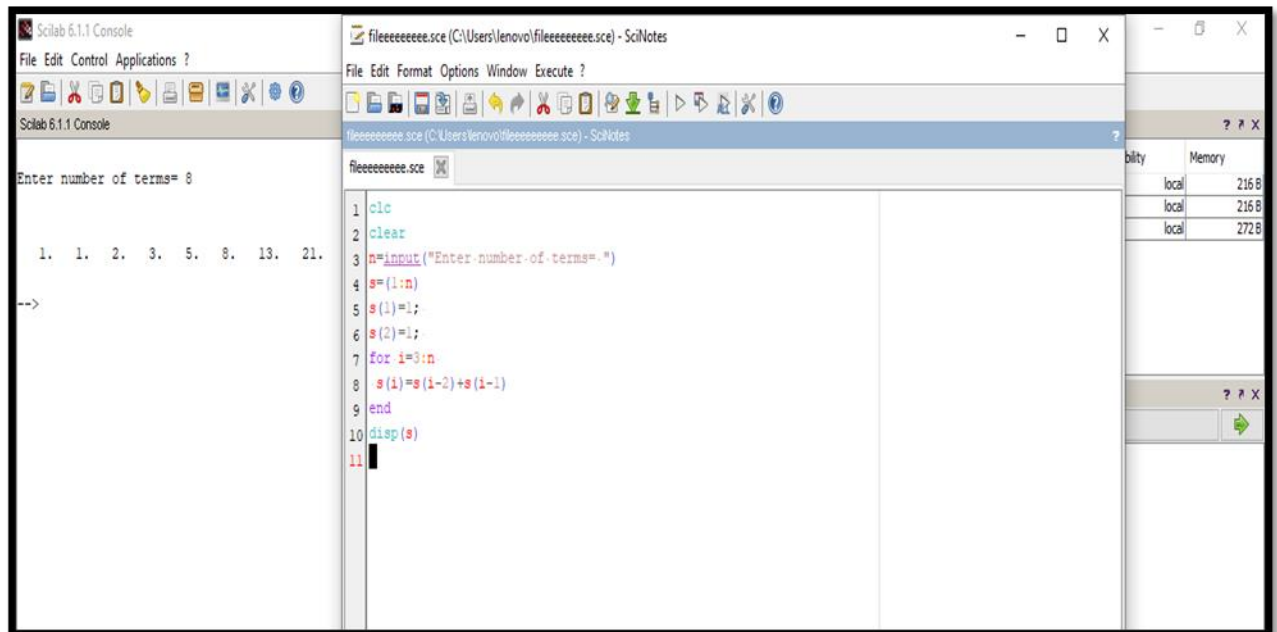
The screenshot shows the Scilab 6.1.1 interface. The console on the left displays the input "Enter the number:9" and the output "Factorial= 362880.". The central editor window shows the following code:

```
1 clc
2 clear
3 n=input("Enter the number:")
4 i=1
5 f=1
6 while i<=n;
7     f=f*i;
8     i=i+1;
9 end
10 disp("Factorial=",f)
11
```

On the right, a variable list table is visible:

Value	Type	Visibility	Memory
3.63e+05	Double	local	216 B
10	Double	local	216 B
9	Double	local	216 B

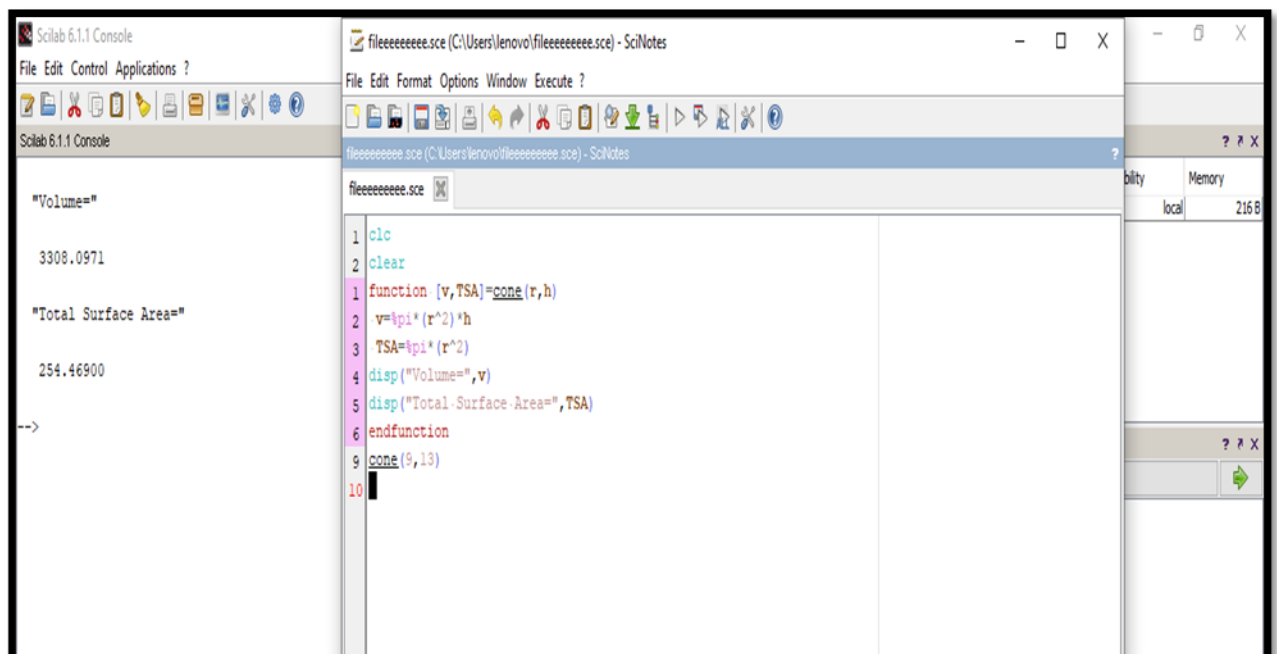
8. To find first 20 terms of Fibonacci sequence using for loop



The screenshot shows the Scilab 6.1.1 Console and SciNotes. The console displays the input "Enter number of terms= 8" and the output "1. 1. 2. 3. 5. 8. 13. 21.". The SciNotes window shows the following code:

```
1 clc
2 clear
3 n=input("Enter number of terms=")
4 s=(1:n)
5 s(1)=1;
6 s(2)=1;
7 for i=3:n
8     s(i)=s(i-2)+s(i-1)
9 end
10 disp(s)
11
```

9. To find volume and total surface area of a cylinder using user defined function



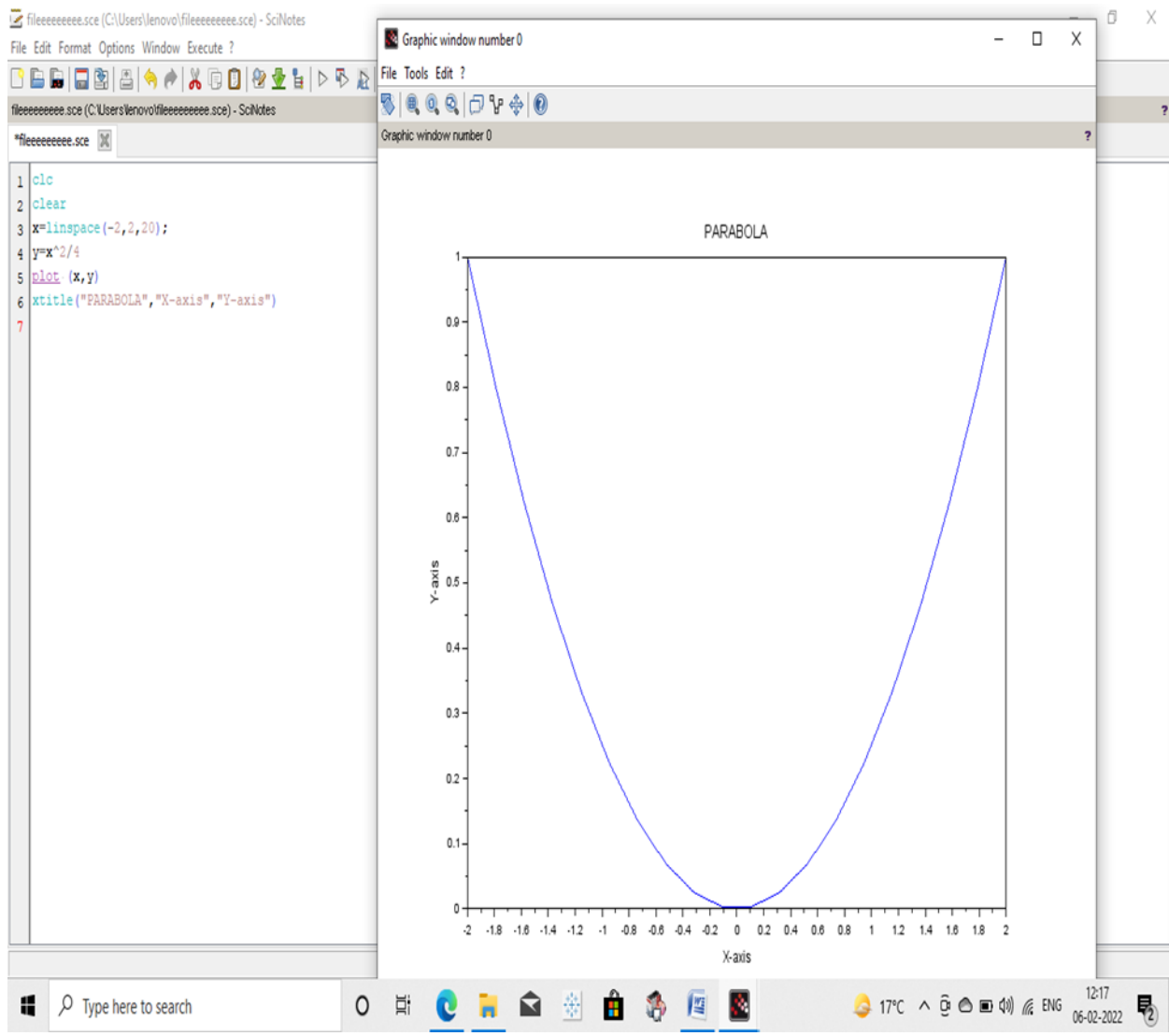
The screenshot shows the Scilab 6.1.1 Console and SciNotes. The console displays the input "Volume=" and the output "3308.0971", and the input "Total Surface Area=" and the output "254.46900". The SciNotes window shows the following code:

```
1 clc
2 clear
3 function [v,TSA]=cone(r,h)
4     v=pi*(r^2)*h
5     TSA=pi*(r^2)
6     disp("Volume=",v)
7     disp("Total Surface Area=",TSA)
8 endfunction
9 cone(9,13)
10
```

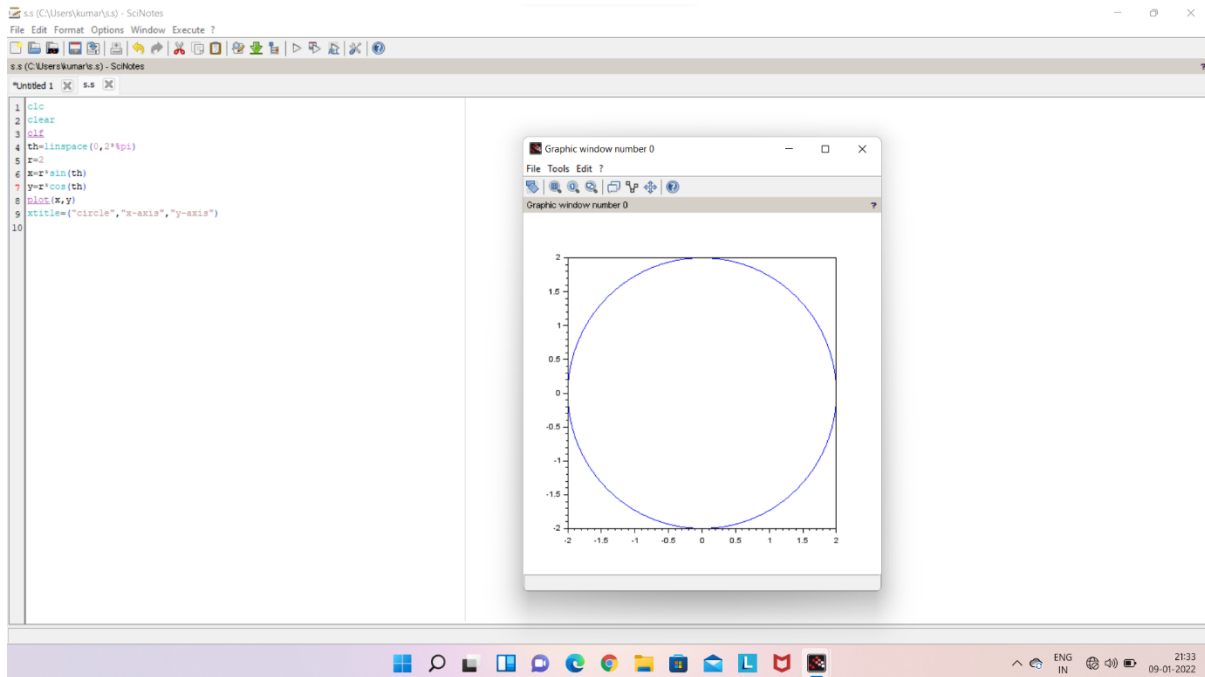
EXERCISE 4

Write a Scilab code in a script file:

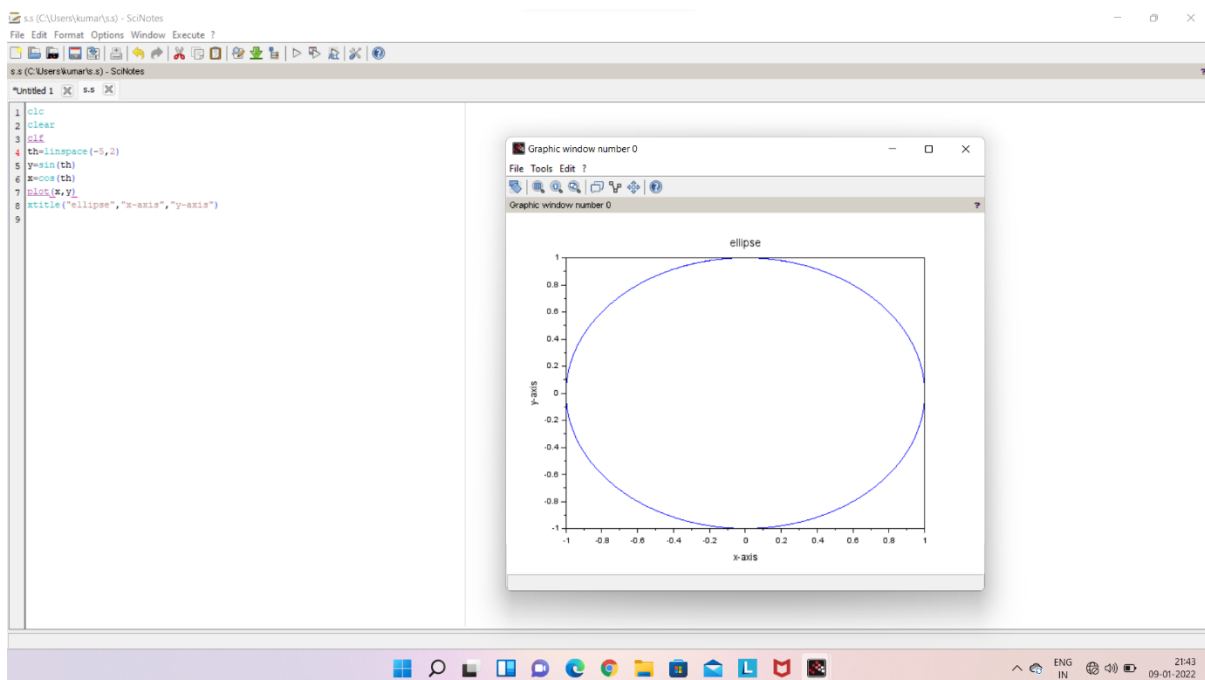
1. To plot Parabola $x^2=4ay$. Take focal length $a=1$



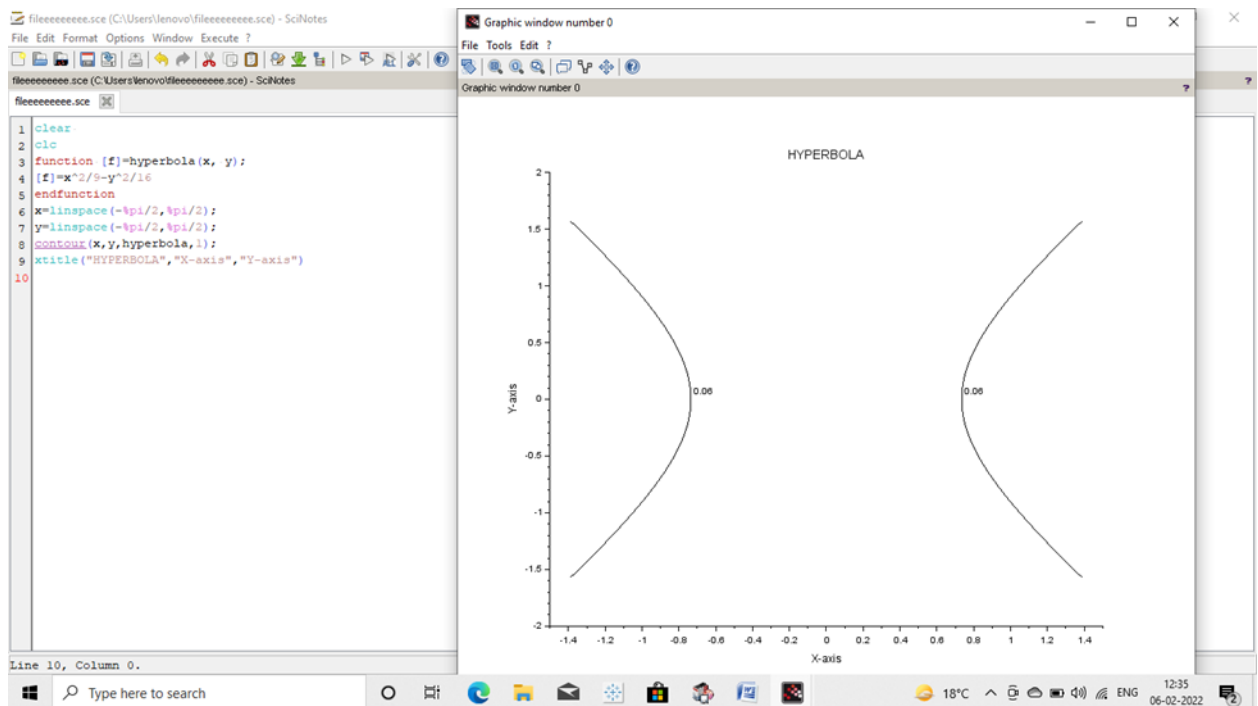
2. To plot Circle. $X^2 + y^2 = a^2$, take $a=1$



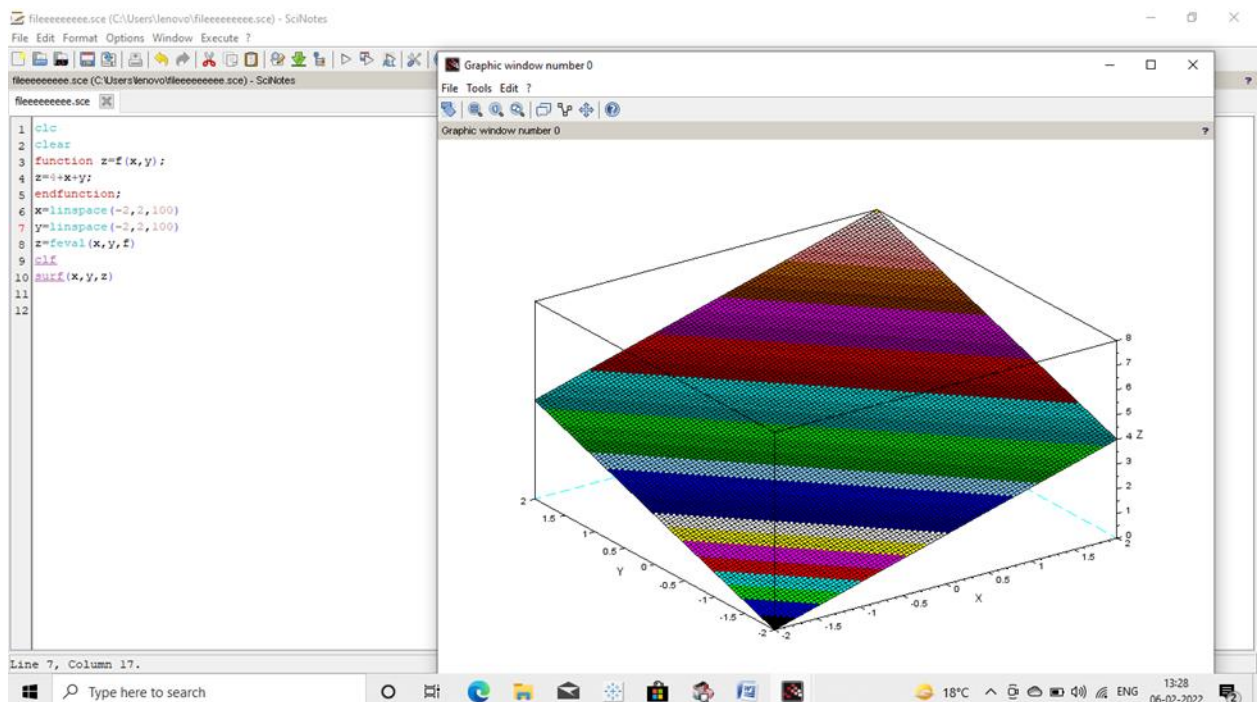
3. To plot Ellipse. $X^2/a^2 + y^2/b^2 = 1$. Take $a=4, b=3$



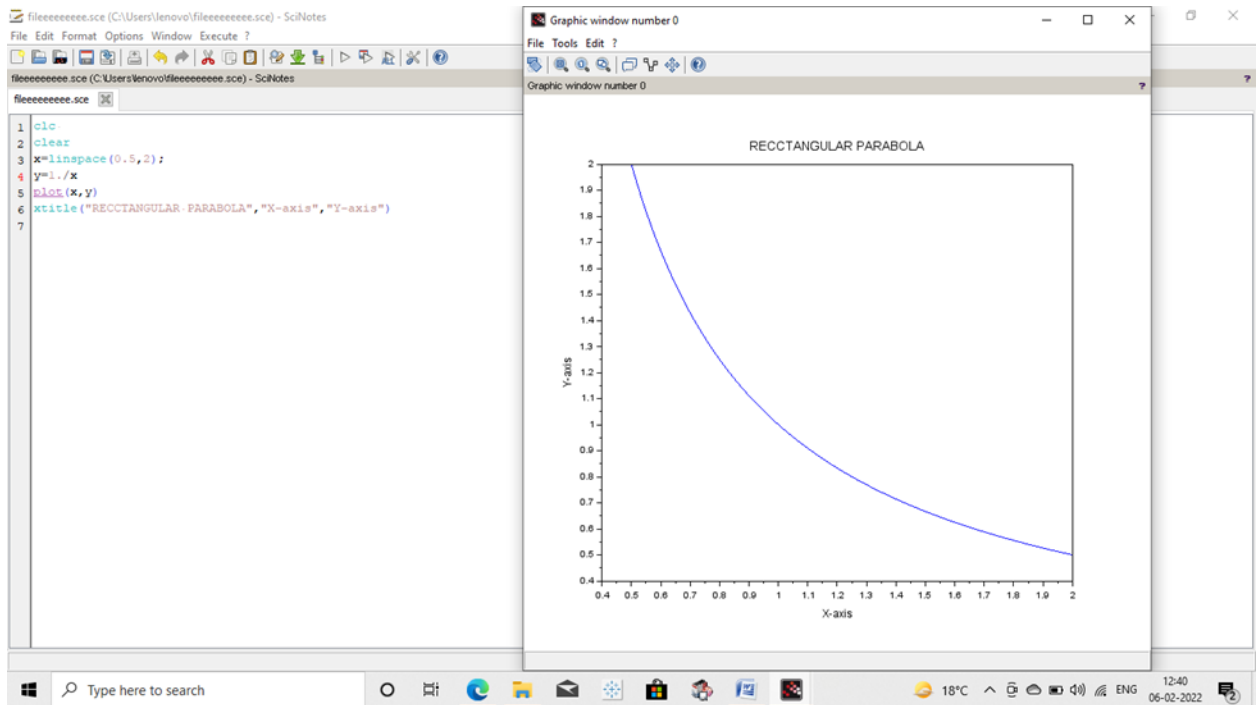
4. To plot Hyperbola. $X^2/a^2 - y^2/b^2 = 1$, Take $a=3$, $b=4$



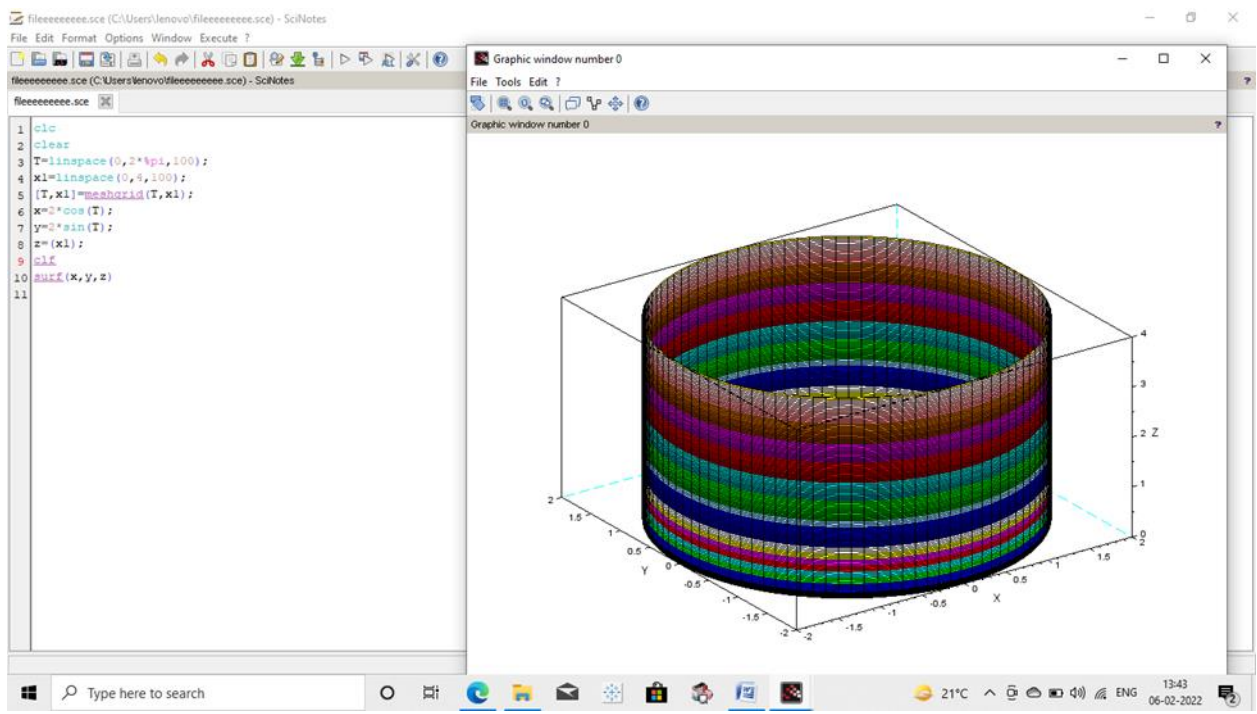
5. To plot a Plane $ax+by+cz=d$ take $a=b=-1, c=1, d=4$ $z=4+x+y$



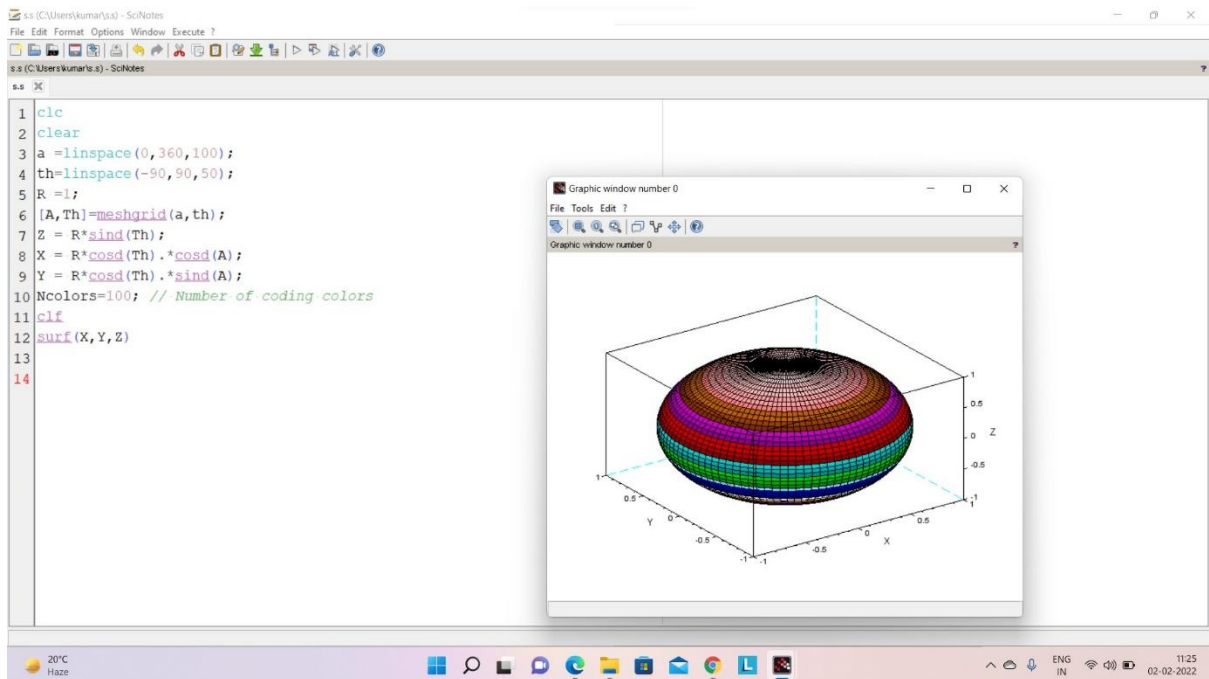
6. To plot rectangular parabola $xy=1$ in interval $[0.5, 2]$



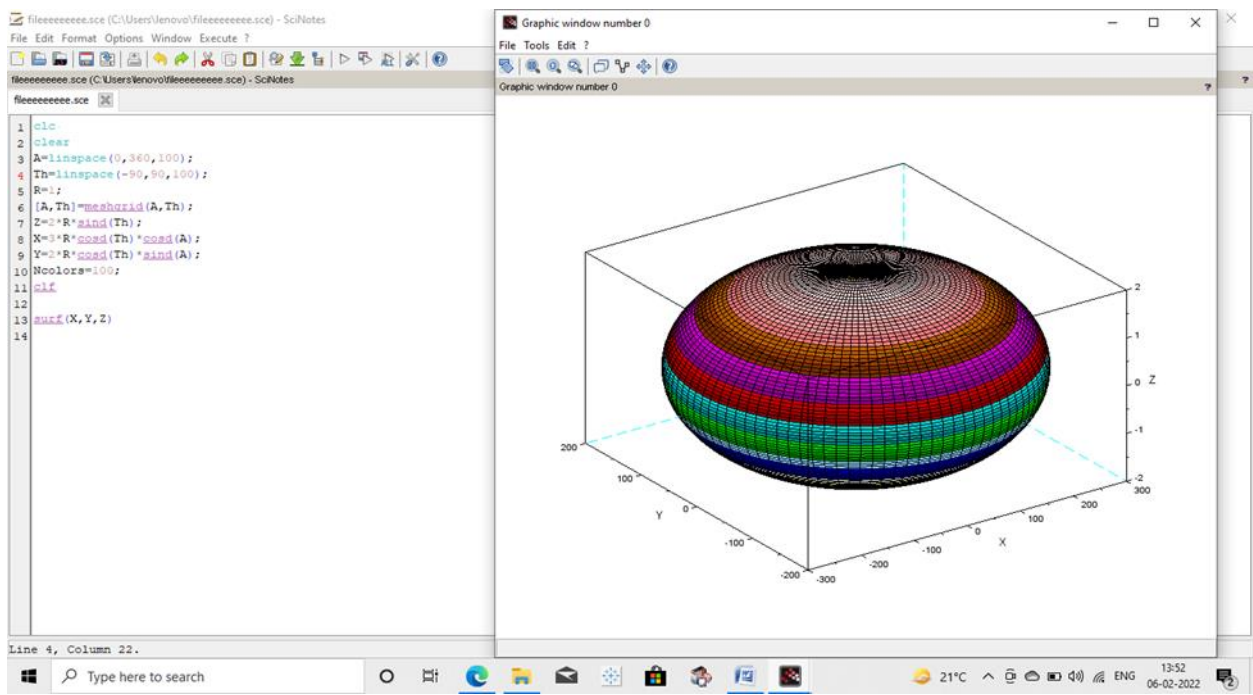
7. To plot right circular Cylinder. $x^2+y^2=a^2$.



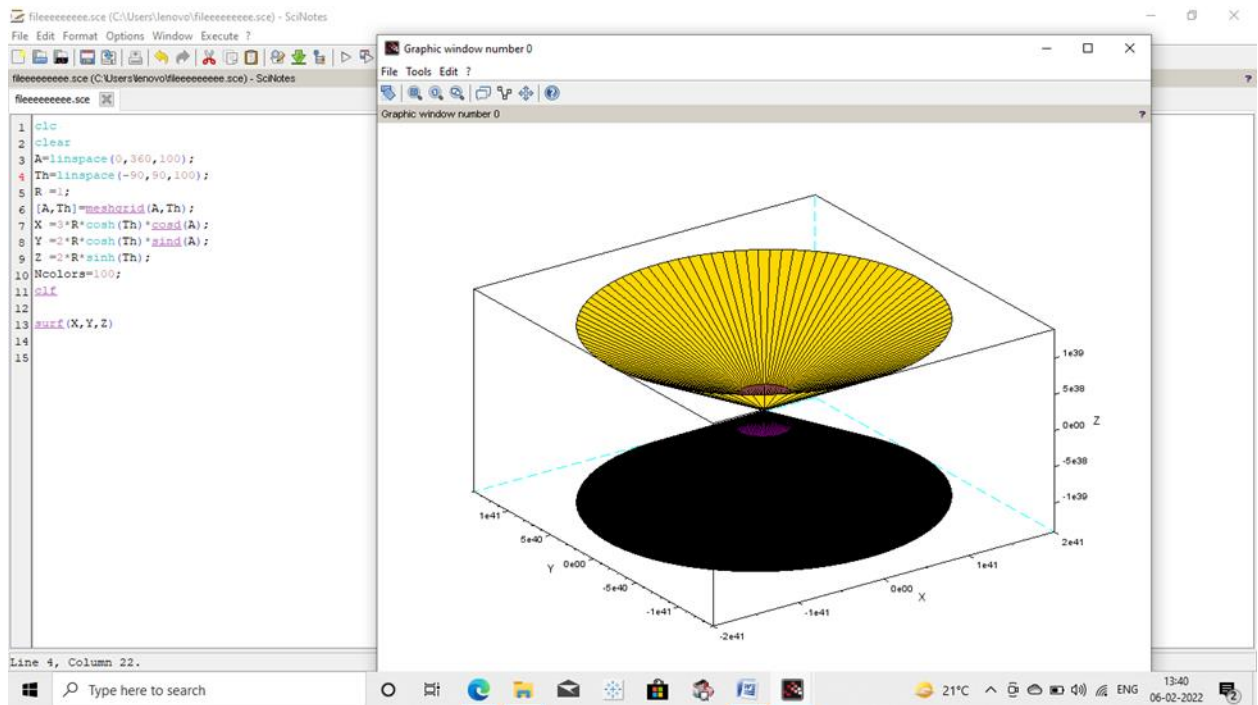
8. To plot Sphere $x^2+y^2+z^2=a^2$, Take $a=1$



9. To plot Ellipsoid. $X^2/a^2 + y^2/b^2 + z^2/c^2 =1$, Take $a=4, b=3, c=2$



10. To plot Hyperboloid $x^2/a^2 + y^2/b^2 - z^2/c^2 = 1$.
Take $a=4, b=3, c=2$



EXPERIMENT 5

Objectives:

To write a SCILAB -CODE

5.1. To find the error in estimated value (y_{est}) of a function $f(x)$ at a point x using its Taylor series.

5.2. To compare a function $f(x)$ and its Taylor series expansion using 2d plots.

Excercises

Write a Scilab code in a script file:

5.1.1] To find the **error** in estimating the value of function $f(x)=e^x$ at $x=1$ using its Taylor series expansion about origin.

5.1.2] To find the **error** in estimating the value of function $f(x)=\sin(x)$ at $x=\pi/2$ using its Taylor series expansion about origin.

5.2.1] To compare the function $f(x)=e^x$ and its Taylor series expansion about origin by using 2d plots

5.2.2] To compare the function $f(x)=\sin(x)$ and its Taylor series expansion about origin by using 2d plots

Solution

5.1.1] Input:

```
clc;
```

```
clear;
```

```
a=0
```

```
x=1
```

```
y=%e^x
```

```
yest=0
n=1
for i=0:1:n
yest=yest+x^i/factorial(i)

end
disp(y)
disp(yest)

error=abs(y-yest)
disp(error)
```

Output:

2.7182818

2.

0.7182818

5.1.2] Input:

clc;

clear;

a=0

```
x=%pi/2
```

```
y=sin(x)
```

```
yest=0
```

```
n=10
```

```
for i=0:1:n
```

```
yest=yest+((-1)^i)*(x^(2*n+i))/factorial(2*n+1))
```

```
end
```

```
disp(y)
```

```
disp(yest)
```

```
error=abs(y-yest)
```

disp(error)

Output:

1.

9.211D-15

1.0000000

5.2.1] Input:

```
clc;
clear;
x=linspace(-10,10,100)
y=%e^x
yest=0
n=10

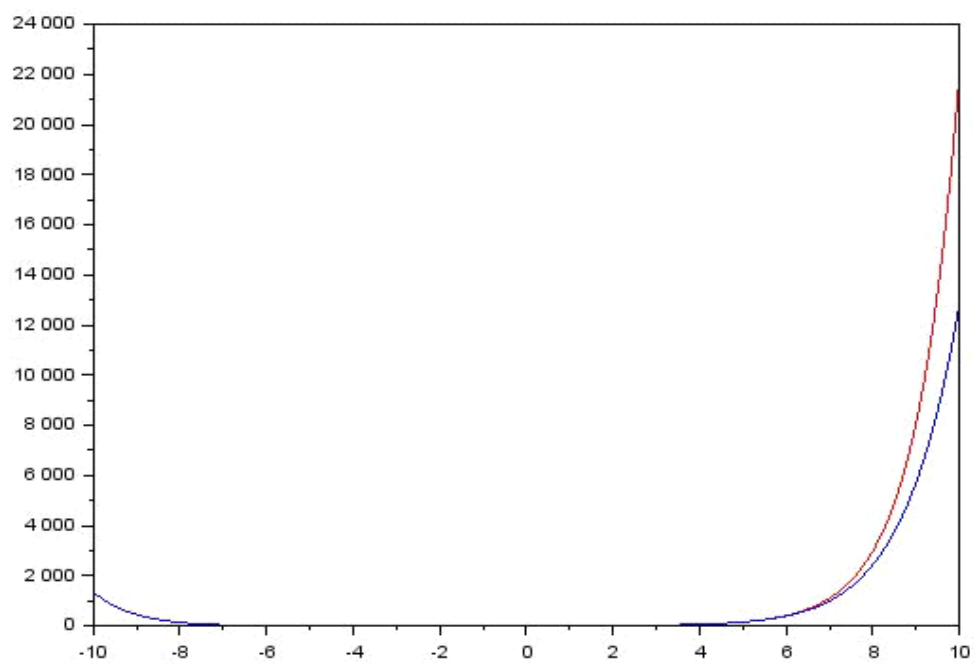
for i=0:1:n

yest=yest+x^i/factorial(i)

end
plot(x,y,"r")
plot(x,yest)
error=abs(y-yest)

disp(error)
```

Output:

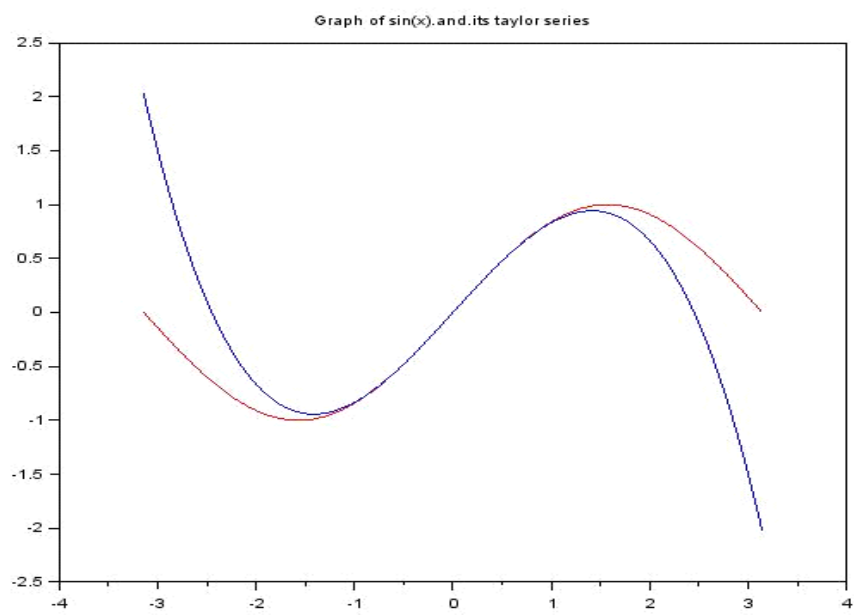


5.2.2] Input:

```
clc;
clear;
x=linspace(-%pi,%pi,100)
y=sin(x)
yest=0
n=1
for i=0:1:n
yest=yest+((-1)^i)*(x^(2*i+1))/factorial(2*i+1))

end
plot(x,y,"r")
plot(x,yest)
xtitle("Graph of sin(x).and.itstaylor series")
error=abs(y-yest)
disp(error)
```

Output :



Experiment-6

Write a SCILAB -CODE for Fourier Half Range series expansion of different wave forms and comparison with the original function.

Objectives:

To write a script file

6.1. To find the **Fourier half range cosine series** of $f(x)$ in Half-range $(0, L)$.

6.2. To find the **Fourier half range sine series** of $f(x)$ in Half-range $(0, L)$.

6.3. To find the **Fourier series** of $f(x)$ in $(-L, L)$.

Exercises: (All exercises to be solved on scinotes)

6.1.1. To find the **Fourier coefficients** of the **Half range cosine series** of $y=f(x)=x^2$ in $(0,2)$ and

compare the graph of the function and the series.

6.1.2. To find the **Fourier coefficients** of the **Half range sine series** of $y=f(x)=x^2$ in $(0,2)$ and **compare the graph** of the function and the series.

6.2.1. To find the **Fourier coefficients** of the **Half range cosine series** of

$y=f(x)=x$ in $(0, \pi)$ and **compare the graph** of the function and the series.

6.2.2. To find the **Fourier coefficients** of the **Half range sine series** of $y=f(x)=x$ in $(0, \pi)$ and **compare the graph** of the function and the series.

6.3.1. To find the **Fourier coefficients** of the **Fourier series** of $y=f(x)=x^2$ in $(0, 2\pi)$ and **compare the graph** of the function and the series.

SOLUTIONS

6.1.1

Source Code

```
clc
```

```
clear
```

```
clf
```

```
L=input("Enput the value of L=")
```

```
n=input("Enter the valu of n=")
```

```
//to find fourircoff a0 n an
```

```
a0=(2/L)*integrate('x^2','x',0,L)
```

```
disp("a0",a0)
```

```
fori=1:n
```

```
a(1)=(2/L)*integrate('x^2*cos((i*%pi*x)/L)','x',0,L)
```

```
end
```

```
disp("a",a)
```

```
//comparing the graph of funtion and its cosine  
series
```

```
x=linspace(0,L,40)
```

```
y=x^2
```

```
series=a0/2
for i=1:n
series=series+a(i)*cos(i*%pi*x/L)
end
plot(x,y)
plot(x,series,"*r")
xlabel("plot function vs its fourier series by
Satyam Shrivastav ","x-axis","y-axis")
legend("plot of function","plot of funtion by
fourier series")
```

Output

Enput the value of L=2

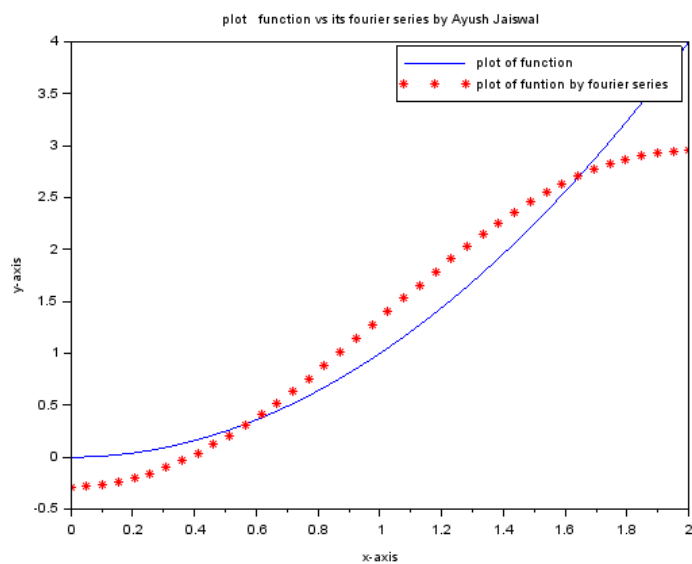
Enter the valu of n=1

"a0"

2.6666667

"a"

-1.6211389



6.1.2

Source Code

```
clc
```

```
clear
```

```
clf
```

```

L=input("Enput the value of L=")
n=input("Enter the valu of n=")
//to find fourircoff bn
fori=1:n
b(i)=(2/L)*integrate('x^2*sin(i*%pi*x/L)','x',0,L)
end
disp("b",b)
//comparing the graph of funtion and its sine
series
x=linspace(0,L,40)
y=x^2
series=0
fori=1:n
series=series+b(i)*sin(i*%pi*x/L)
end
plot(x,y)
plot(x,series,"*r")
xtitle("plot  function vs its fourier series by
Satyam Shrivastav]", "x-axis", "y-axis")

```

legend("plot of function","plot of funtion by
fourier series")

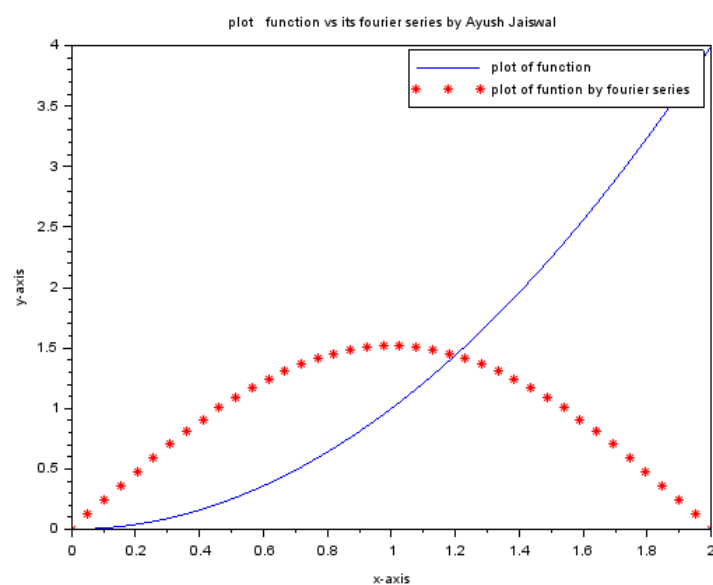
Output

Enput the value of L=2

Enter the valu of n=1

"b"

1.5144300



6.2.1

Source Code

```
clc
```

```
clear
```

```
clf
```

```
L=input("Enput the value of L=")
```

```
n=input("Enter the valu of n=")
```

```
//to find fourircoff a0 n an
```

```
a0=(2/L)*integrate('x','x',0,L)
```

```
disp("a0",a0)
```

```
fori=1:n
```

```
a(1)=(2/L)*integrate('x*cos((i*%pi*x)/L)','x',0,L)
```

```
end
```

```
disp("a",a)
```

```
//comparing the graph of funtion and its cosine series
```

```
x=linspace(0,L,40)
```

```
y=x
```

```
series=a0/2
```



```

for i=1:n
    series=series+a(i)*cos(i*%pi*x/L)
end
plot(x,y)
plot(x,series,"*r")
xlabel("plot function vs its fourier series by
Satyam Shrivastav","x-axis","y-axis")
legend("plot of function","plot of function by
fourier series")

```

Output

Enter the value of L=%pi

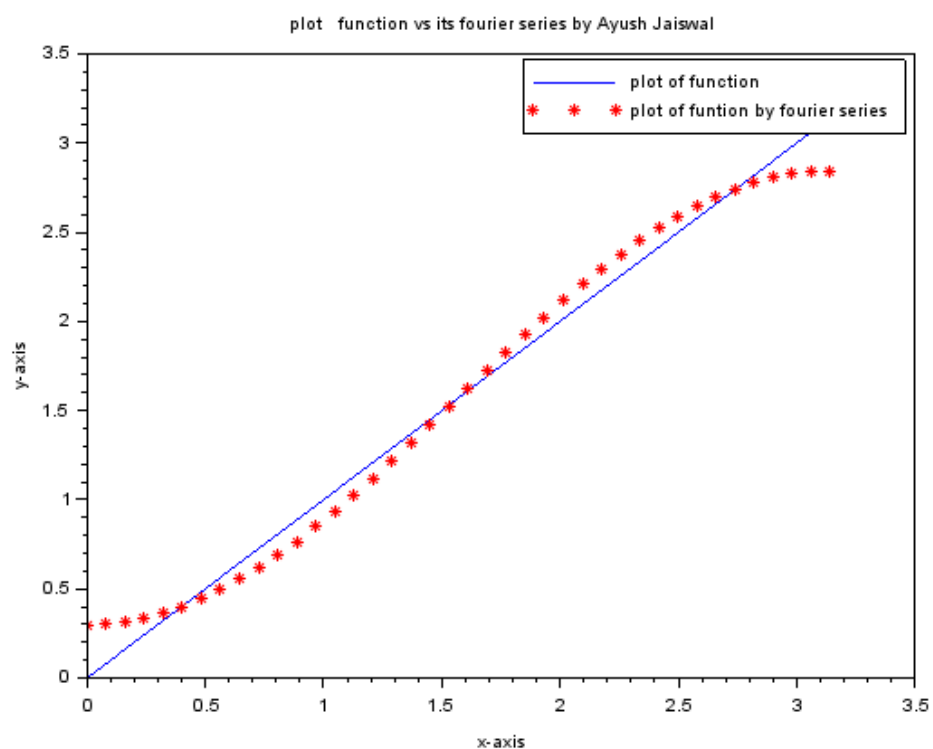
Enter the value of n=1

"a0"

3.1415927

"a"

-1.2732395



6.2.2

Source Code

```
clc
```

```
clear
```

```
clf
```

```

L=input("Enput the value of L=")
n=input("Enter the valu of n=")
//to find fourircoff bn
fori=1:n
b(i)=(2/L)*integrate('x*sin(i*%pi*x/L)','x',0,L)
end
disp("b",b)
//comparing the graph of funtion and its sine series
x=linspace(0,L,40)
y=x
series=0
fori=1:n
series=series+b(i)*sin(i*%pi*x/L)
end
plot(x,y)
plot(x,series,"*r")
xtitle("plot  function vs its fourier series by
Satyam Shrivastav","x-axis","y-axis")

```

legend("plot of function","plot of funtion by
fourier series")

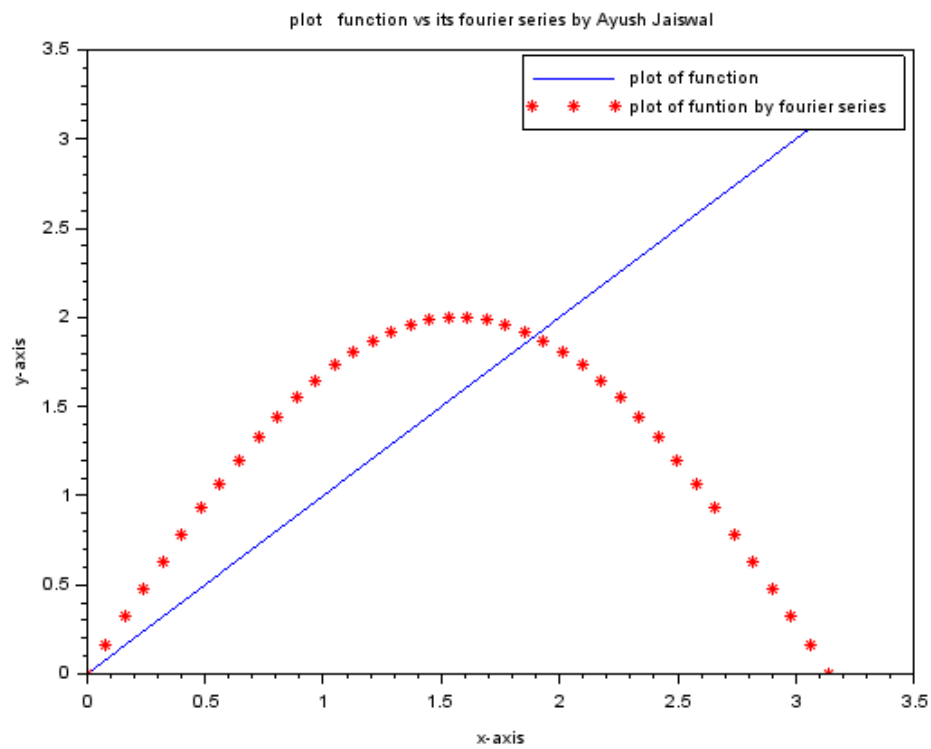
Output

Enput the value of $L=\pi$

Enter the valu of $n=1$

"b"

2.0000000



6.3.1

Source Code

```
clc
```

```
clear
```

```
clf
```

```

L=input("Enput the value of L=")
n=input("Enter the valu of n=")
//To find the Fourier coefficients of the Fourier
series of y=f(x)= x2
a0=(2/L)*integrate('x^2','x',0,1)
fori=1:n
a(i)=(2/L)*integrate('(x^2)*cos(i*%pi*x/L)','x',0,1)
b(i)=(2/L)*integrate('(x^2)*sin(i*%pi*x/L)','x',0,1)
end
disp("a0",a0)
disp("a",a)
disp("b",b)
//comparing the graph of the function and the
series.
x=linspace(0,2,40)
y=x^2
series=a0/2
fori=1:n
series=series+(a(i)*cos(i*%pi*x/L))

```

```

series=series+(b(i)*sin(i*%pi*x/L))
end
plot(x,y,)
plot(x,series,"*r")
xtitle("plot  function vs its fourier series by
Satyam Shrivastav","x-axis","y-axis")
legend("plot of function","plot of funtion by
fourier series")

```

Output

Enput the value of $L=2*\pi$

Enter the valu of $n=1$

"a0"

0.1061033

"a"

0.0982632

"b"

0.0386938

