MATLAB
HARMONIC SERIES

Mihir Gupte
19BCE1149

Code -

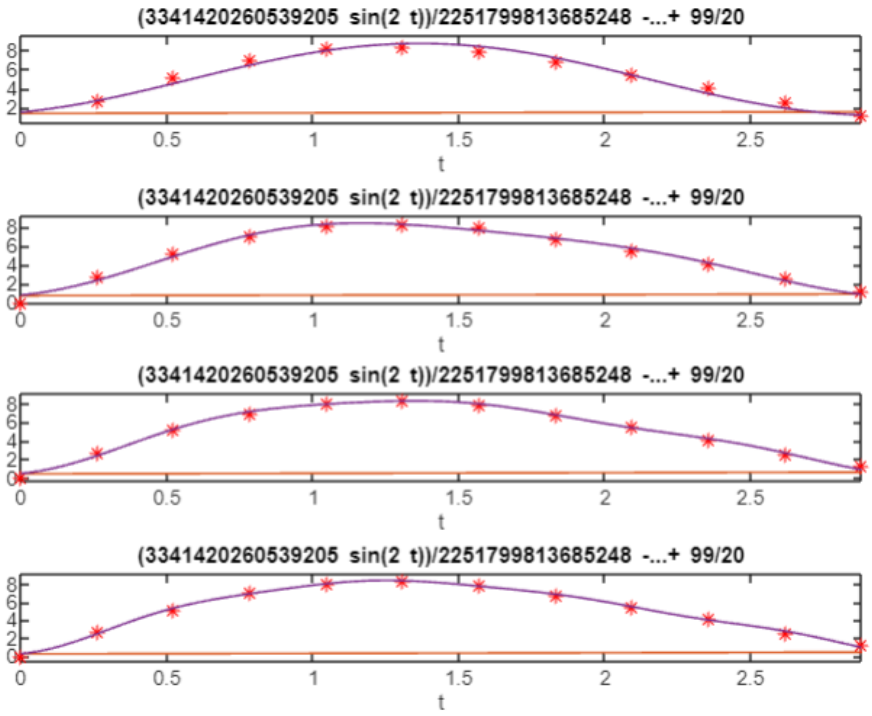
```
syms t
n= input('Enter the number of data points n : '); % number of x values
x_0= input('Enter the starting value of x : '); % x_1 [x(1), x(n)] x_1=x_0+s,
x_2=x_1+s= x_0+2s
count = input('type 0 if the unit of x is deg. type a non-zero number otherwise');
s=input('Enter the length of the spacing between successive values of x :');
n1= input('Enter the number of harmonic of the series n1 : '); % a_1, a_2, a_{n1}
for i=1:n
x(i)=x_0+(i-1)*s;
end
if (count == 0)
x=x*pi/180;
s=s*pi/180;
end
y = input('Enter the y values (as a row vector) :') % y=[y_1 y_2 y_3 y_n]
if y(1)== y(n)
l=0.5*(x(n)-x(1));
else
l=0.5*(x(n)+s-x(1));
end
a_0= (2/n)*sum(y)
for i=1:n1
yc=y.*cos(i*pi*x/l);
ys=y.*sin(i*pi*x/l);
a(i)=(2/n)*sum(yc);
b(i)=(2/n)*sum(ys);
end
F_s=a_0/2;
for i=1:n1
subplot(n1,1,i)
plot(x,y,'r*');
hold on
F_s = F_s+a(i).*cos(i*pi*t/l)+b(i).*sin(i*pi*t/l);
subplot(n1,1,i)
ezplot(F_s, [x(1) x(n)])
end
```

```
disp('Fourier series :')
vpa(F_s,4)
```

1.

```
>> harmonic
Enter the number of data points n :

  12
Enter the starting value of x :

  0
type 0 if the unit of x is deg. type a non-zero number otherwise

  0
Enter the length of the spacing between successive values of x :

  15
Enter the number of harmonic of the series n1 :

  4
Enter the y values (as a row vector) :

  [0 2.7 5.2 7 8.1 8.3 7.9 6.8 5.5 4.1 2.6 1.2 0]


y =


        0    2.7000    5.2000    7.0000    8.1000    8.3000    7.9000
6.8000    5.5000    4.1000    2.6000    1.2000         0



a_0 =


   9.9000
```

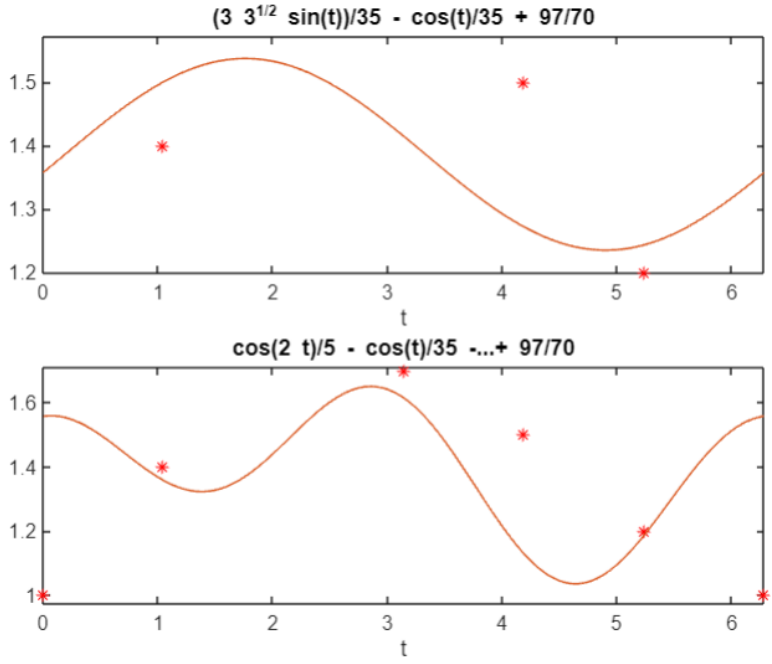
```
Fourier series :


ans =


1.484*sin(2.0*t) - 0.7333*cos(4.0*t) - 0.2*cos(8.0*t) - 3.417*cos(2.0*t) +
6.291e-16*sin(4.0*t) + 1.48e-16*sin(8.0*t) - 0.35*cos(6.0*t) +
0.01667*sin(6.0*t) + 4.95
```



2.

```
>> harmonic
Enter the number of data points n :
7
Enter the starting value of x :
0
type 0 if the unit of x is deg. type a non-zero number otherwise
1
```

```
Enter the length of the spacing between successive values of x :
pi/3
Enter the number of harmonic of the series n1 :
2
Enter the y values (as a row vector) :
[1 1.4 1.9 1.7 1.5 1.2 1]

y =

   1.0000    1.4000    1.9000    1.7000    1.5000    1.2000    1.0000


a_0 =

   2.7714


x =

        0    1.0472    2.0944    3.1416    4.1888    5.2360    6.2832

Fourier series :


ans =


0.2*cos(2.0*t) - 0.04949*sin(2.0*t) - 0.02857*cos(t) + 0.1485*sin(t) + 1.386
```


(3 3^1/2 sin(t))/35 - cos(t)/35 + 97/70
1.5
1.4
1.3
1.2
0
1
2
3
4
5
6
t
cos(2 t)/5 - cos(t)/35 -...+ 97/70
1.6
1.4
1.2
1
0
1
2
3
4
5
6
t