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3. The following values of y = f(x) give the displacement in inches of a certain machine part for the rotation x of the flywheel. Write a MATLAB function to expand y in terms of a Fourier series upto four harmonics. Plot the graph of the same using MATLAB and record the output.

x	0	π/6	2π/6	3π/6	4π/6	5π/6	π
Y=f(x)	0	9.2	14.4	17.8	17.3	11.7	0

and f(x + π) = f(x)

∗ Take a print of MATLAB code along with output and graph, then attach this sheet with the sheets in which you have answered first two questions.

MATLAB code to find the Fourier series for the function f(x):

```
function [] = n_harmonics( x,y,n,T )
a=[];
b=[];
for i=1:n
    a(i) = (2*sum(y.*cos((i*2*pi*x)/T)))/length(x);
    b(i) = (2*sum(y.*sin((i*2*pi*x)/T)))/length(x);
end
a0 = (2*sum(y))/length(x);
a = [a0 a];

syms t
fs = a(1)/2;
for i=1:n
    fs =
fs+a(i+1)*cos((i*2*pi*t)/T)+b(i)*sin((i*2*pi*t)/T);
end
fprintf('the required fourier series is: \n')
disp(vpa(fs,3));
plot(x,y,'o')
hold on
t = linspace(x(1),x(end),1000);
y1=eval(fs);
plot(t,y1,'k')
end
```

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```
Command Window
>> x=0:pi/6:pi;
>> y=[0 9.2 14.4 17.8 17.3 11.7 0];
>> T=pi;
>> n=4;
>> n_harmonics( x,y,n,T )
the required fourier series is:
0.099*sin(4.0*t) - 2.43*cos(4.0*t) - 2.43*cos(8.0*t) - 1.34*sin(2.0*t) - 6.63*cos(2.0*t) - 0.099*sin(8.0*t) - 2.0*cos(6.0*t) + 3.65e-15*sin(6.0*t) + 10.1

fx >>
```

Figure 1 required Fourier series

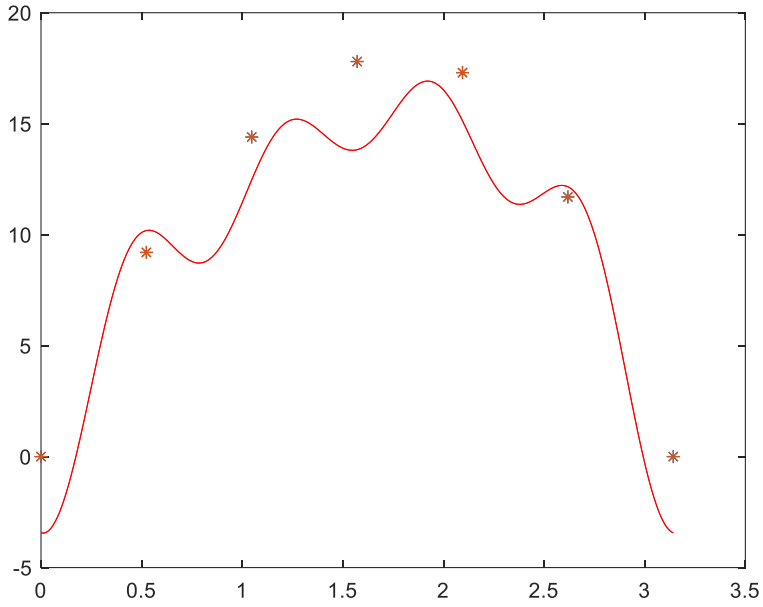

Figure 2 graph of Fourier Series of f(x)