

ASSIGNMENT:-7

EECE:-212

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Anik

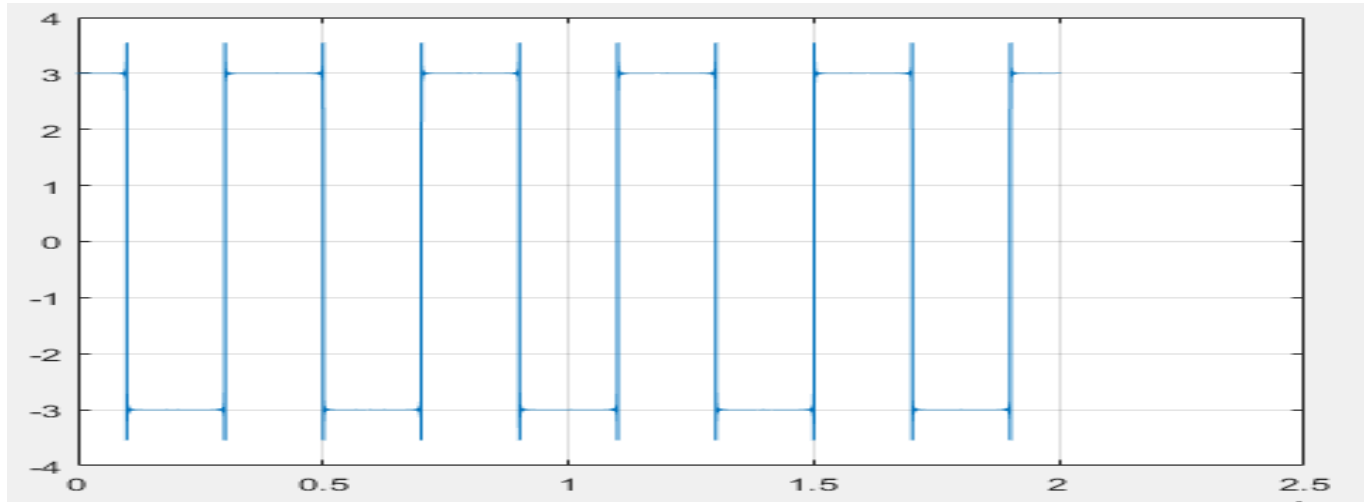
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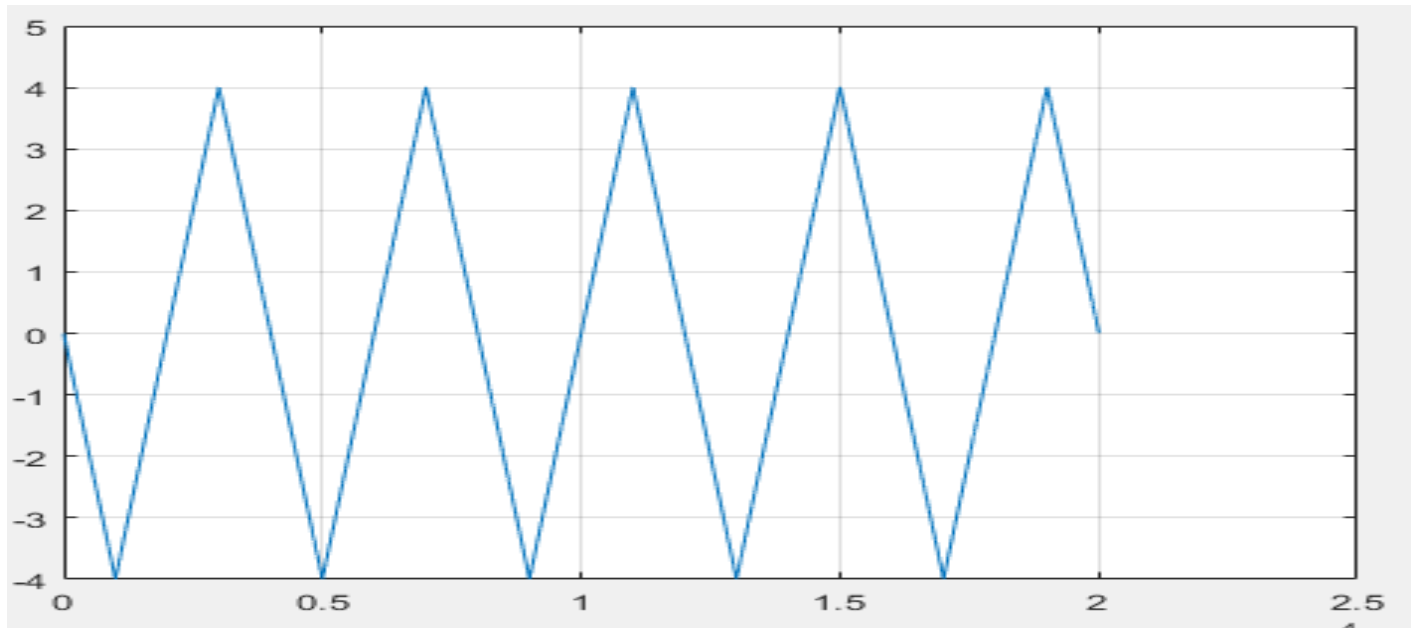
Here are some mathematical problems solved by MATLAB 2020a according to the questions. The answers are given below:

Find the Fourier series representation of the given function, $f(t)$. Calculate first 10, 50 and 100 coefficients of the series and comment on the accuracy of the reconstructed function. Use Simpson's 1/3 rule for integration.

b)



c)



Solution:

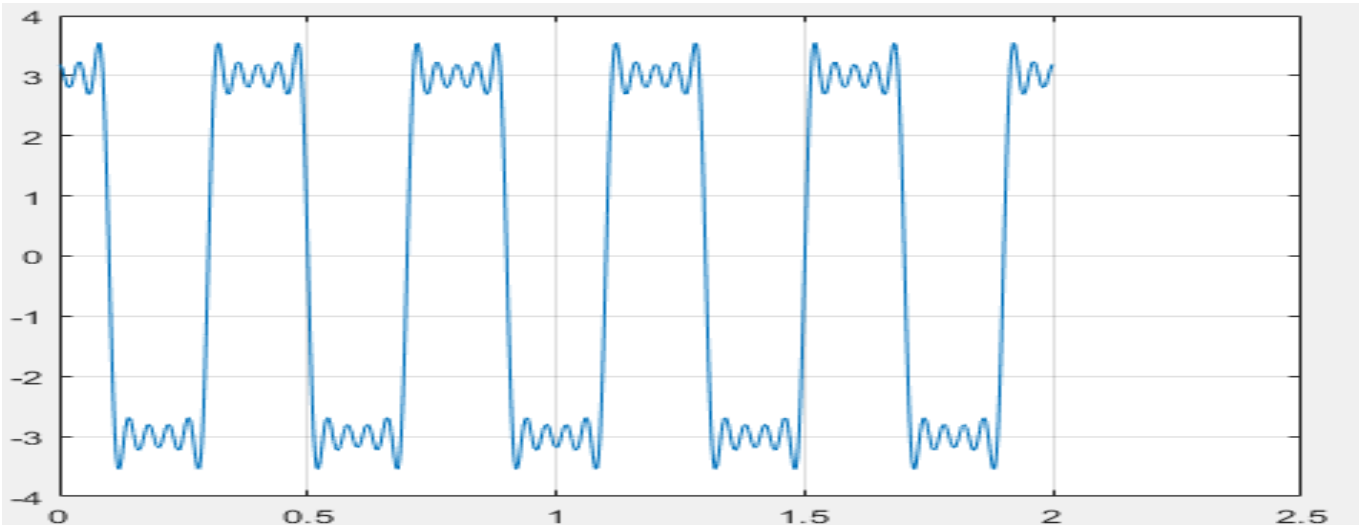
Here have to plot this figure with MatLab code by using Fourier series representation. And have to show coefficients of 10, 50 100. The program is given bellow:

B)

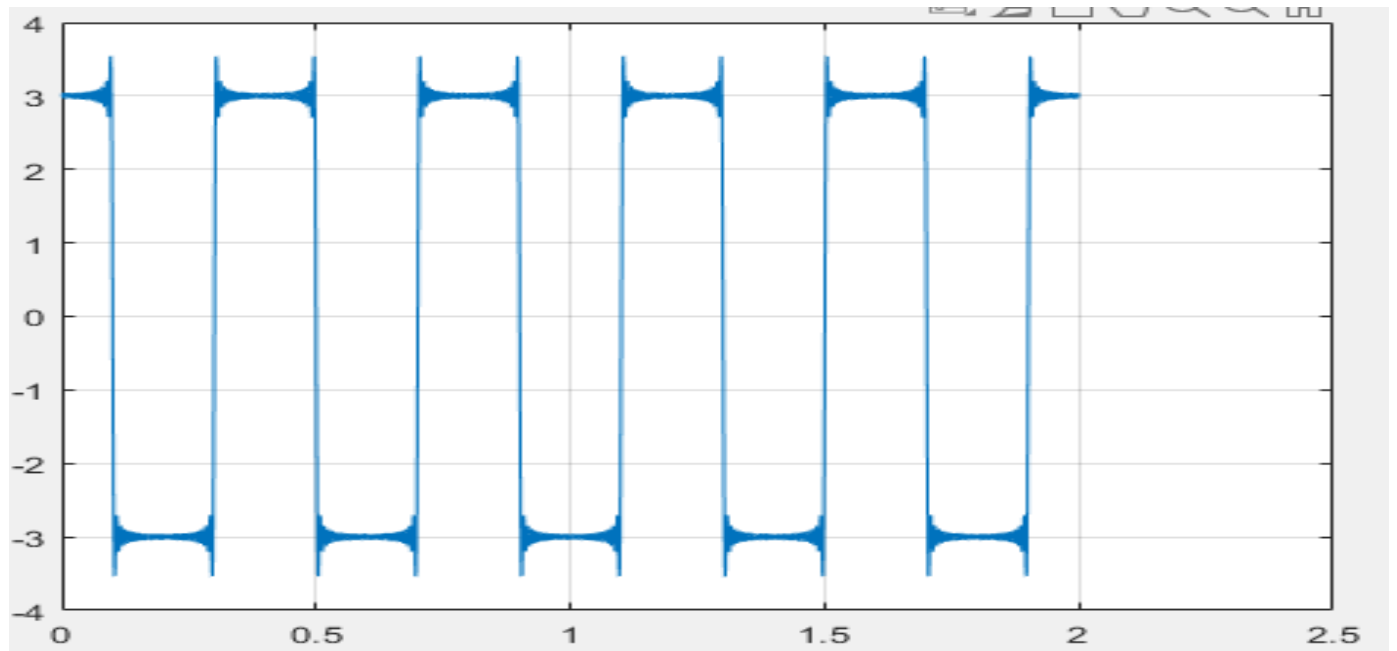
```
1 clear all
2 close all
3 clc
4 t=0:0.001:4;
5 h=0.001;
6 T=4;
7 coff=1000; % 10, 50 & 100
8 N = length(t);
9 f = zeros(N,1);
10 for i=1:N
11     if i<=(N-1)/4
12         f(i) = 3;
13     elseif i>=(N-1)/4 && i<=3*(N-1)/4
14         f(i) = -3;
15     elseif i>3*(N-1)/4 && i<=N
16         f(i) = 3;
17     end
18 end
19 w = 2*pi/T;
20 A = zeros(coff,1);
21 B = zeros(coff,1);
22 A0 = (1/N)*sum(f);
23 for n=1:coff
24     y = f.*cos(n*w*t);
25     A(n) = y(1) + y(N);
26     sum1=0;
27     sum2=0;
28     i=1;
29     for j=2:N-1
30         if rem(i,2)==1
31             sum1=sum1+y(j);
32         else
33             sum2=sum2+y(j);
34         end
35         i=i+1;
36     end
37     A(n) = A(n) + 2*sum2 + 4*sum1;
38     A(n) = A(n)*(h/3);
39     y = f.*sin(n*w*t);
40     B(n) = y(1) + y(N);
41     sum1=0;
42     sum2=0;
43     i=1;
44     for j=2:N-1
45         if rem(i,2)==1
46             sum1=sum1+y(j);
47         else
48             sum2=sum2+y(j);
49         end
50         i=i+1;
51     end
52     B(n) = B(n) + 2*sum2 + 4*sum1;
53     B(n) = B(n)*(h/3);
54 end
55 A = (2/T)*A;
56 B = (2/T)*B;
57 sum3 = A0;
58 for n=1:coff
59     sum3 = sum3 + B(n)*sin(n*w*t) + A(n)*cos(n*w*t);
60 end
61 sum4 = repmat(sum3,1,5);
62 t = 1:length(sum4);
63 plot(t,sum4);
```

Now changing the coefficient and plot the figure.

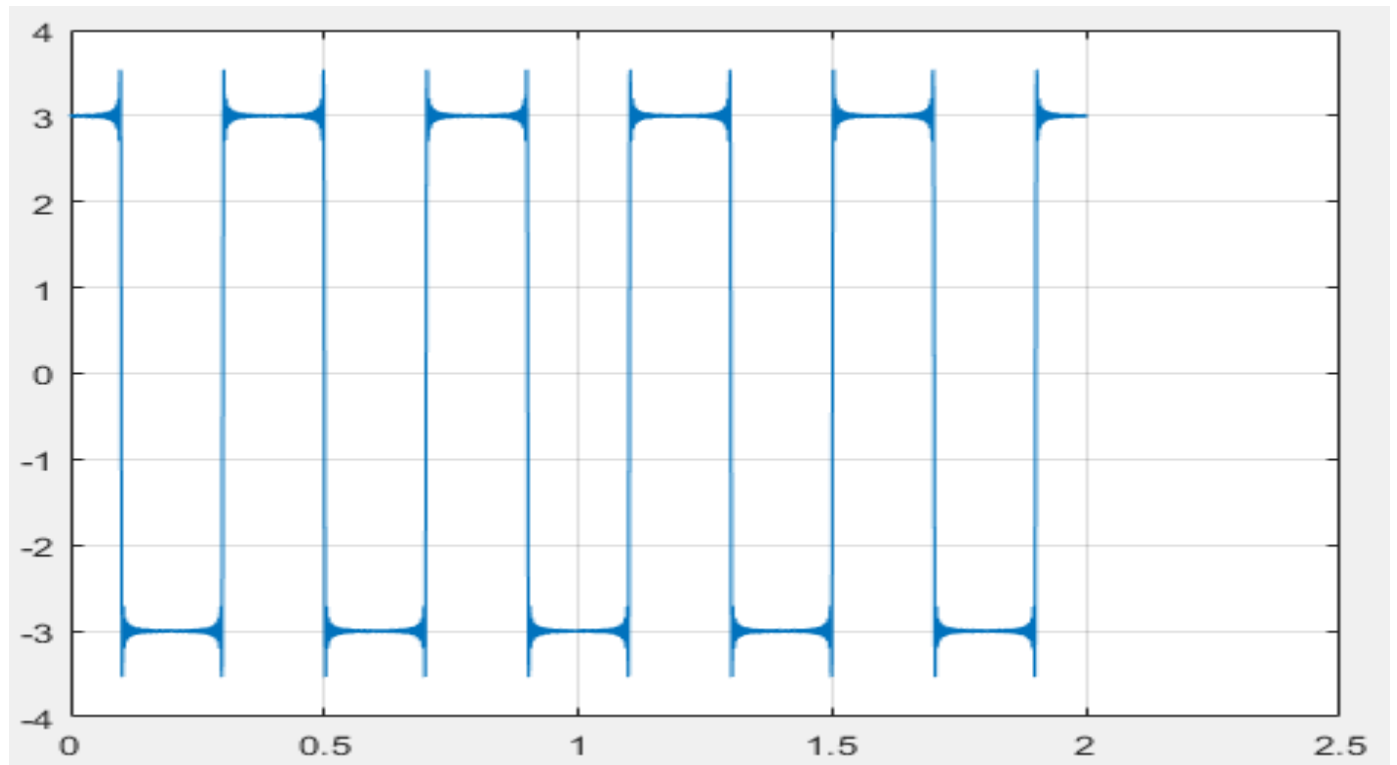
Coefficient: 10



Coefficient: 50



Coefficient: 100



Comment:

Here we can see how much we increase the coefficient, the accuracy level is also getting increase with it. To have much accuracy we should use the highest coefficient.

Now have to plot this figure with MatLab code by using Fourier series representation. And have to show coefficients of 10, 50 100. The program is given bellow:

```

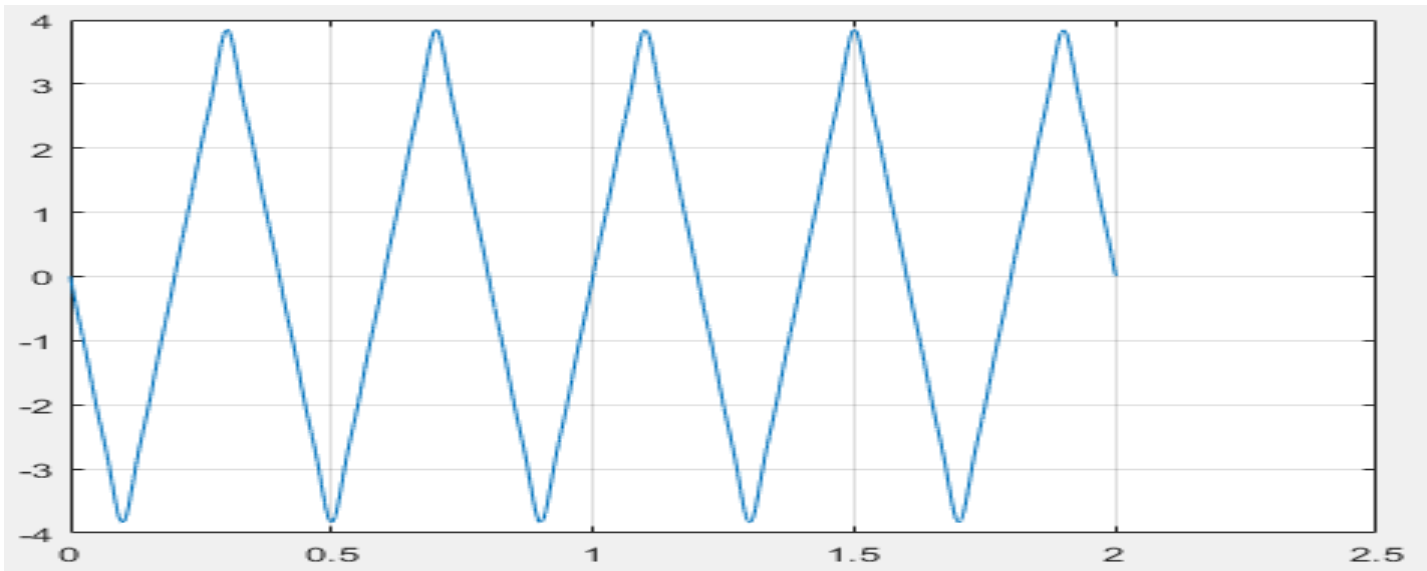
1 - clear all
2 - close all
3 - clc
4 - t=0:0.001:4;
5 - h=0.001;
6 - T=4;
7 - coff=100;
8 - N = length(t);
9 - f = zeros(N,1);
10 - for i=2:N
11 -     if i<=(N+1)/4
12 -         f(i) = f(i-1) -4*h;
13 -     elseif i>(N+1)/4 && i<=(N+1)*3/4
14 -         f(i) = f(i-1) +4*h;
15 -     elseif i>(N+1)*3/4 && i<=(N)
16 -         f(i) = f(i-1) -4*h;
17 -     end
18 - end
19 - w = 2*pi/T;
20 - A = zeros(coff,1);
21 - B = zeros(coff,1);
22 - A0 = (1/N)*sum(f);
23 - for n=1:coff
24 -     y = f.*cos(n*w*t);
25 -     A(n) = y(1) + y(N);
26 -     sum1=0;
27 -     sum2=0;
28 -     i=1;
29 -     for j=2:N-1
30 -         if rem(i,2)==1
31 -             sum1=sum1+y(j);
32 -         else
33 -             sum2=sum2+y(j);
34 -         end
35 -         i=i+1;
36 -     end
37 -     A(n) = A(n) + 2*sum2 + 4*sum1;
38 -     A(n) = A(n)*(h/3);
39 -     y = f.*sin(n*w*t);
40 -     B(n) = y(1) + y(N);
41 -     sum1=0;
42 -     sum2=0;
43 -     i=1;
44 -     for j=2:N-1
45 -         if rem(i,2)==1
46 -             sum1=sum1+y(j);
47 -         else
48 -             sum2=sum2+y(j);
49 -         end
50 -         i=i+1;
51 -     end
52 -     B(n) = B(n) + 2*sum2 + 4*sum1;
53 -     B(n) = B(n)*(h/3);
54 - end
55 - A = (2/T)*A;
56 - B = (2/T)*B;
57 - sum3 = A0;
58 - for n=1:coff
59 -     sum3 = sum3 + B(n)*sin(n*w*t) + A(n)*cos(n*w*t);
60 - end
61 - sum4 = repmat(sum3,1,5);
62 - t = 1:length(sum4);
63 - plot(t,sum4);

```

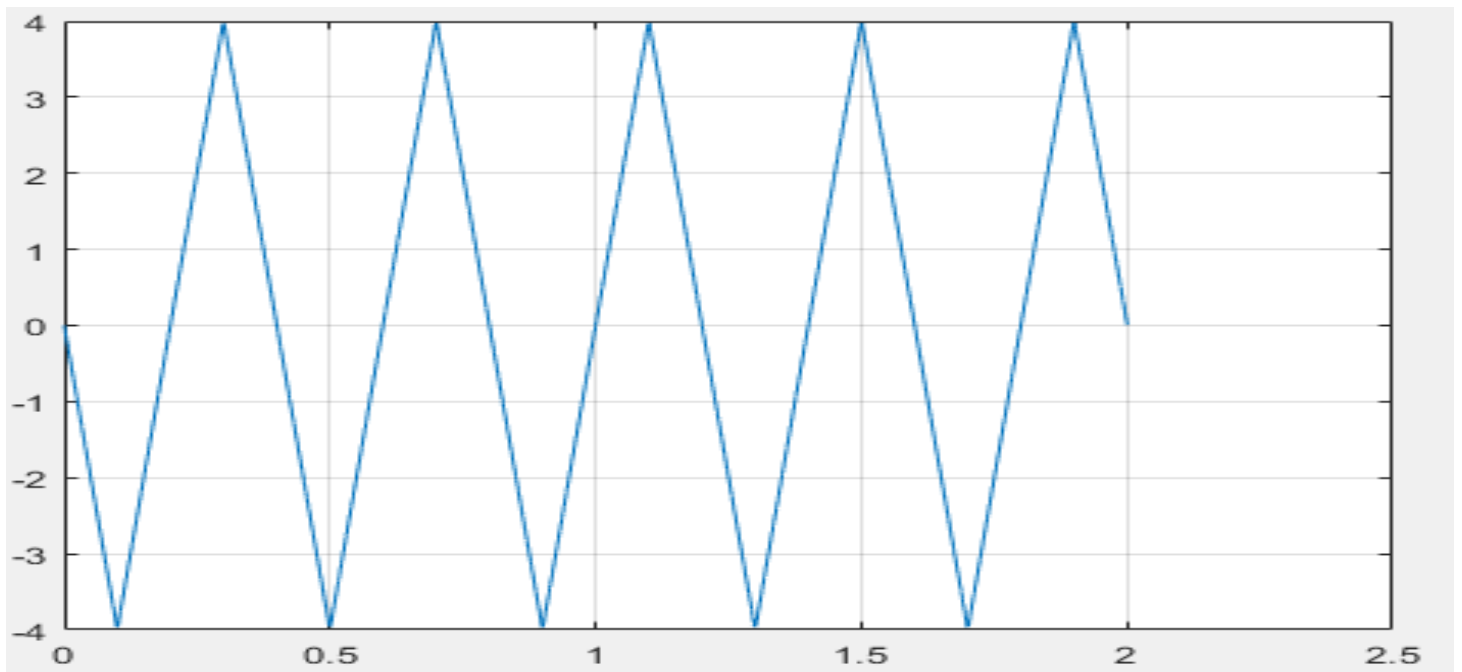
PICCOLLAGE

Now changing the coefficient and plot the figure.

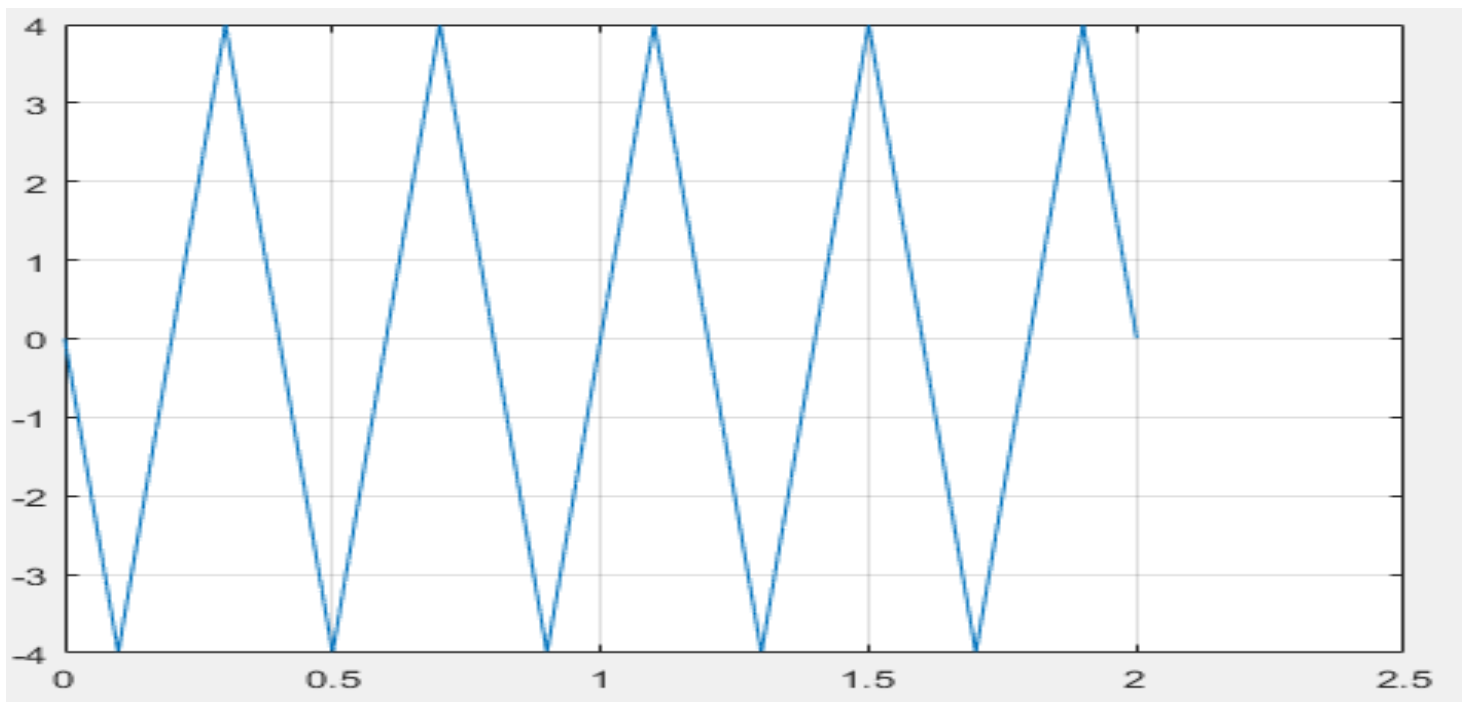
Coefficient: 10



Coefficient: 50



Coefficient: 100



Comment: How much we increase the coefficient, the accuracy level is also getting increase with it. But here is magnifying change for changing coefficient. The apex point is a little bit curve for 50 and comparatively, for 100 its apex point is sharper. To have much accuracy we should use the highest coefficient.