

**Name: Ketaki Mahajan****Batch: A – 3****Roll Number: 16014022050****Question 1:**

Draw the graph of the following function and its Fourier series (with  $n = 100$  and  $n = 50$ ).

$$f(x) = x - x^2, \quad 0 \leq x \leq 2\pi$$

**Code (n = 50) -**

```
clear; clc;
L = %pi;
x = 0:0.01:2*L;
f = x - x.^2; // define function f(x)

a0 = (1/(2*L)) * inttrap(x, f); // calculate a0

for n = 1:50
    f1 = f .* cos(%pi * n * x / L);
    a(n) = (1/L) * inttrap(x, f1); // define Fourier constant a(n)
end

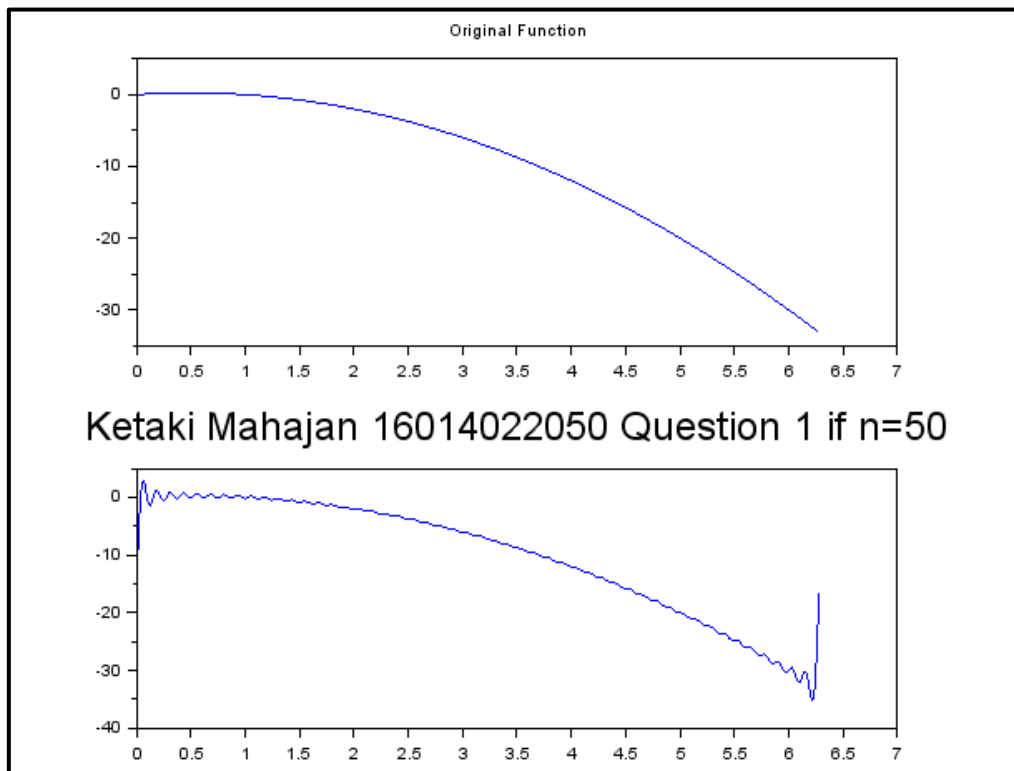
for n = 1:50
    f2 = f .* sin(%pi * n * x / L);
    b(n) = (1/L) * inttrap(x, f2); // define Fourier constant b(n)
end

subplot(2, 1, 1);
plot(x, f);
title('Original Function');

u = 0; y = 0;
for n = 1:50
    u = a(n) * cos(%pi * n * x / L) + b(n) * sin(%pi * n * x / L);
    y = y + u;
end
fs = y + a0;

subplot(2, 1, 2);
plot(x, fs);
title('Ketaki Mahajan 16014022050 Question 1 if n=50', 'fontsize', 5);
```

**Output (n = 50) -**



**Code (n = 100) -**

```
clear; clc;
L = %pi;
x = 0:0.01:2*L;
f = x - x.^2; // define function f(x)

a0 = (1/(2*L)) * inttrap(x, f); // calculate a0

for n = 1:100
    f1 = f .* cos(%pi * n * x / L);
    a(n) = (1/L) * inttrap(x, f1); // define Fourier constant a(n)
end

for n = 1:100
    f2 = f .* sin(%pi * n * x / L);
    b(n) = (1/L) * inttrap(x, f2); // define Fourier constant b(n)
end

subplot(2, 1, 1);
plot(x, f);
title('Original Function');

u = 0; y = 0;
for n = 1:100
    u = a(n) * cos(%pi * n * x / L) + b(n) * sin(%pi * n * x / L);
```

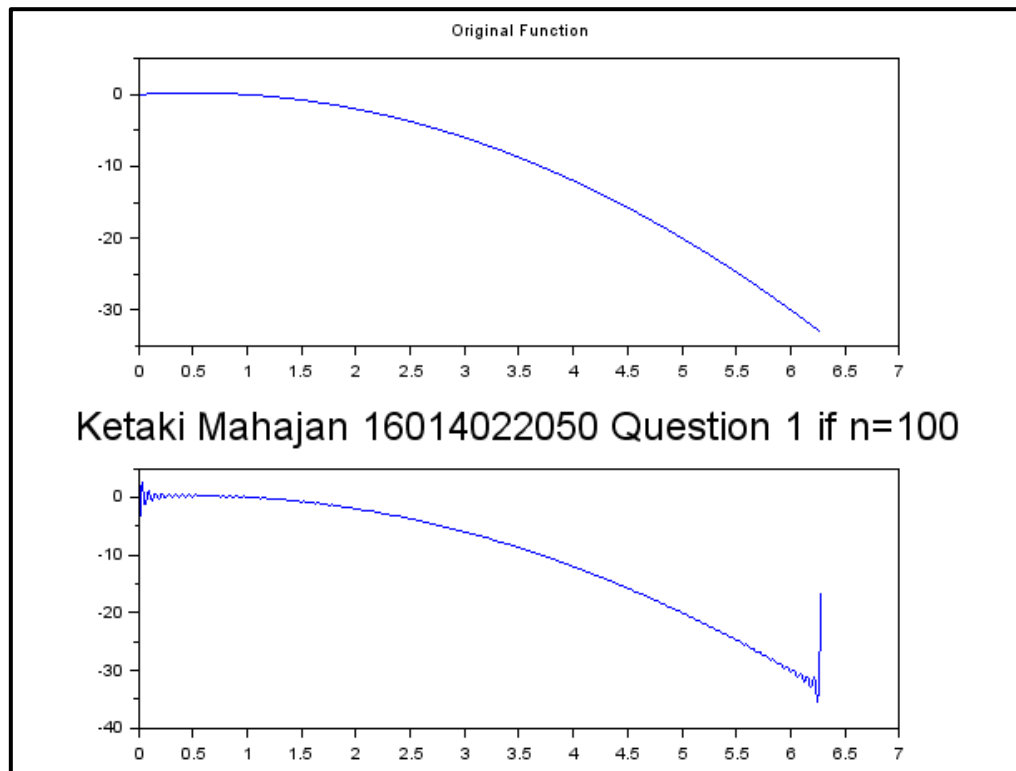
```

y = y + u;
end
fs = y + a0;

subplot(2, 1, 2);
plot(x, fs);
title('Ketaki Mahajan 16014022050 Question 1 if n=100','fontsize',5);

```

**Output (n = 100) -**



## Question 2:

Draw the graph of the following function and its Fourier series (with  $n = 20$  and  $n = 5$ ).

$$f(x) = \cos(x), \quad -\pi \leq x \leq \pi$$

**Code (n = 5) -**

```

clear; clc;
L = %pi;
x = -L:0.01:L;
f = cos(x); // define function f(x)

a0 = (1/(2*L)) * inttrap(x, f); // calculate a0

for n = 1:5

```

```

f1 = f.* cos(%pi * n * x * (1/L));
a(n) = (1/L) * inttrap(x, f1); // define Fourier constant a(n)
end

for n = 1:5
    f2 = f.* sin(%pi * n * x * (1/L));
    b(n) = (1/L) * inttrap(x, f2); // define Fourier constant b(n)
end

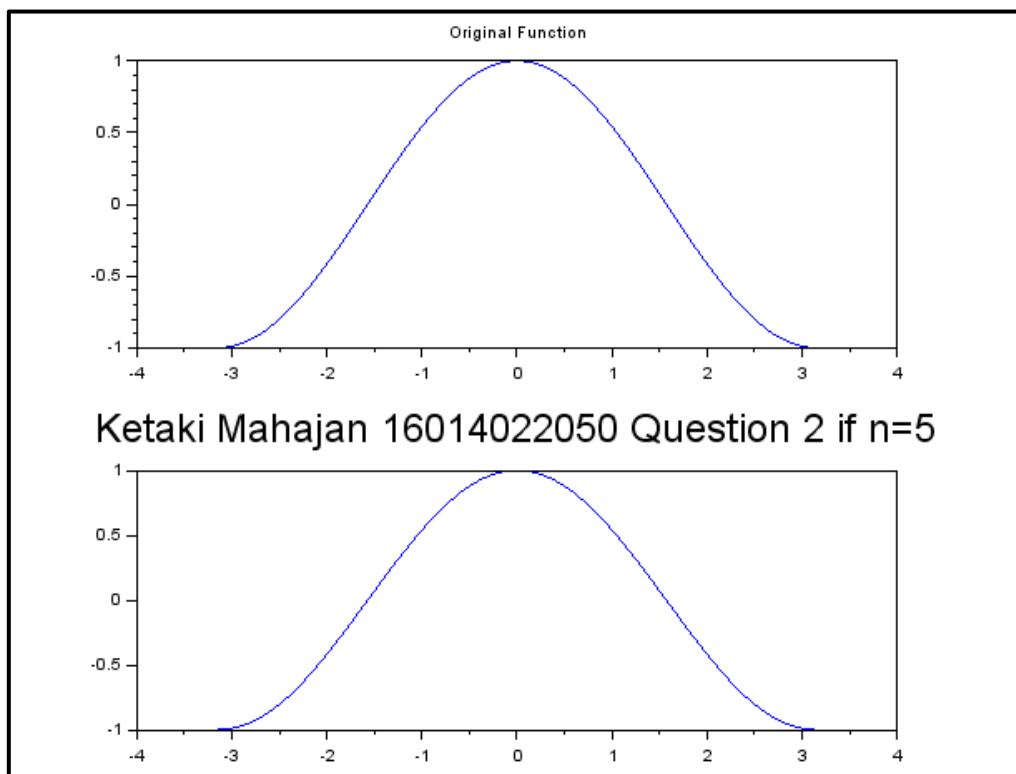
subplot(2, 1, 1);
plot(x, f);
title('Original Function');

u = 0; y = 0;
for n = 1:5
    u = a(n) * cos(%pi * n * x * (1/L)) + b(n) * sin(%pi * n * x * (1/L));
    y = y + u;
end
fs = y + a0;

subplot(2, 1, 2);
plot(x, fs);
title('Ketaki Mahajan 16014022050 Question 2 if n=5','fontsize',5);

```

**Output (n = 5) -**



**Code (n = 20) -**

```

clear; clc;
L = %pi;
x = -L:0.01:L;
f = cos(x); // define function f(x)

a0 = (1/(2*L)) * inttrap(x, f); // calculate a0

for n = 1:20
    f1 = f .* cos(%pi * n * x * (1/L));
    a(n) = (1/L) * inttrap(x, f1); // define Fourier constant a(n)
end

for n = 1:20
    f2 = f .* sin(%pi * n * x * (1/L));
    b(n) = (1/L) * inttrap(x, f2); // define Fourier constant b(n)
end

subplot(2, 1, 1);
plot(x, f);
title('Original Function');

u = 0; y = 0;
for n = 1:20
    u = a(n) * cos(%pi * n * x * (1/L)) + b(n) * sin(%pi * n * x * (1/L));
    y = y + u;
end
fs = y + a0;

subplot(2, 1, 2);
plot(x, fs);
title('Ketaki Mahajan 16014022050 Question 2 if n=20','fontsize',5);

```

**Output (n = 20) -**

