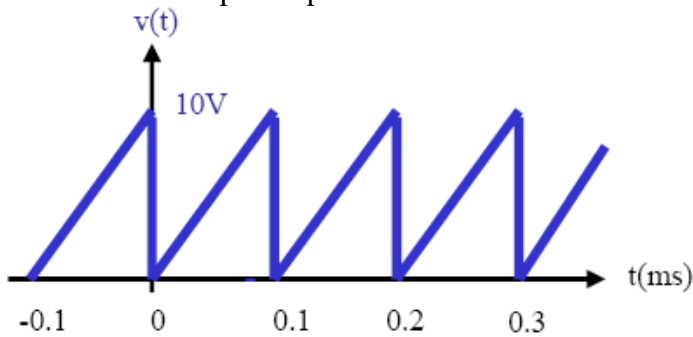


The MatLab program below graphs the function shown for 3 periods using Fourier Series terms up to the 5th harmonic with 10 points/period for the 5th harmonic.

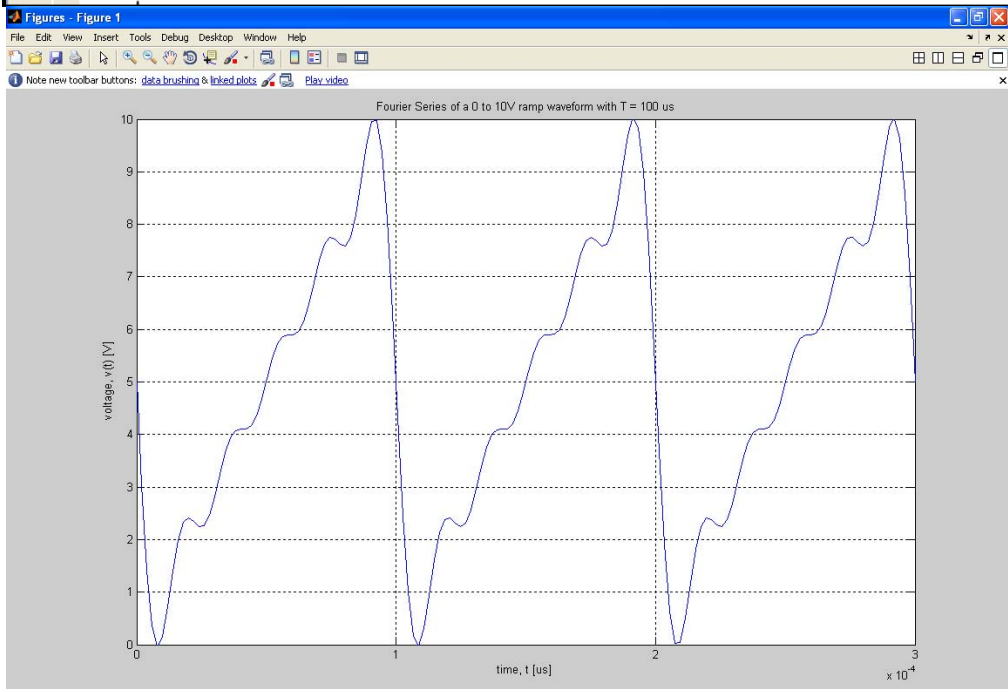


$$v(t) = 5 - \frac{10}{n\pi} \sum_{n=1}^{\infty} \sin(20000n\pi t)$$

```

1 -   clc
2 -   % Fourier Series analysis for a ramp waveform
3 -   % Filename: FourierRamp2.m
4 -   % Graph 3 periods of the Fourier Series using terms up to the 50th harmonic
5 -   % From class: v(t) = 5 - 10/(n*pi)*Sum[sin(20000*n*pi*t)]
6 -   disp('The Fourier Series for a ramp waveform will be graphed. ');
7 -   disp('One period of the waveform with T=100us is described as follows: ');
8 -   disp('v(t) increases linearly from 0 to 10V over the range 0 to 100us');
9 -   disp('Three cycles will be graphed using terms up to the 5th harmonic. ')
10 -  v = 5;           % Begin with DC term
11 -  T = 100e-6;     % Period
12 -  wo = 2*pi/T;   % Fundamental frequency
13 -  t=linspace(0,3*T,10*5*3); %vary t linearly from 0 to 3T using 15 points
14 -  % Note: 3 cycles of fundamental = 3*5 = 15 cycles of 5th harmonic
15 -  %       (15 cycles)*(10 points/cycle) = 150 points
16 -  for n=1:1:5 %Add 1st - 5th harmonics
17 -      v = v - 10/n/pi*sin(n*wo*t);
18 -  end
19 -  plot(t,v)
20 -  grid
21 -  Title('Fourier Series of a 0 to 10V ramp waveform with T = 100 us')
22 -  xlabel('time, t [us]')
23 -  ylabel('voltage, v(t) [V]')

```



The program was modified to use terms up to the 50th harmonic with 100 points/period for the 50th harmonic

```
1 -   clc
2 -   % Fourier Series analysis for a ramp waveform
3 -   % Filename: FourierRamp2B.m
4 -   % Graph 3 periods of the Fourier Series using terms up to the 50th harmonic
5 -   % From class: v(t) = 5 - 10/(n*pi)*Sum[sin(20000*n*pi*t)]
6 -   disp('The Fourier Series for a ramp waveform will be graphed. ');
7 -   disp('One period of the waveform with T=100us is described as follows: ');
8 -   disp('v(t) increases linearly from 0 to 10V over the range 0 to 100us');
9 -   disp('Three cycles will be graphed using terms up to the 50th harmonic. ');
10 -  v = 5;           % Begin with DC term
11 -  T = 100e-6;     % Period
12 -  wo = 2*pi/T;   % Fundamental frequency
13 -  t=linspace(0,3*T,100*50*3); %vary t linearly from 0 to 3T using 150 points
14 -  % Note: 3 cycles of fundamental = 3*5 = 150 cycles of 50th harmonic
15 -  %       (150 cycles)*(100 points/cycle) = 15000 points
16 -  for n=1:1:50 %Add 1st - 50th harmonics
17 -      v = v - 10/n/pi*sin(n*wo*t);
18 -  end
19 -  plot(t,v)
20 -  grid
21 -  Title('Fourier Series of a 0 to 10V ramp waveform with T = 100 us')
22 -  xlabel('time, t [us]')
23 -  ylabel('voltage, v(t) [V]')
```

