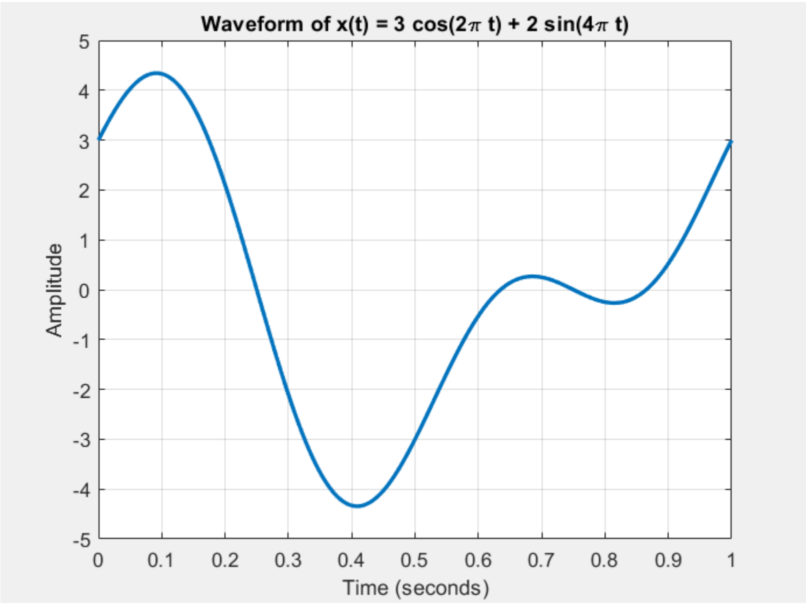
Problem 1: Consider a continuous-time signal 3cos (2πt) + 2sin (4πt).

1. Sketch the waveform of x (t) over one period.

T (period) = **1 second**. So, our range is (0, 1)



And here is the MATLAB code that I used;

tvector = linspace(0, 1, 1000);	**I learned that I have to use time vector**
func = 3 * cos(2*pi*t) + 2 * sin(4*pi*t);	**This is our function**
plot(tvector, func, 'LineWidth', 2);	**This function draws the graph mainly.**
title('x(t) = 3 cos(2*pi*t) + 2 sin(4*pi*t)');	**This is title of the graph**
xlabel('Time (seconds)');	**Name of the X label**
ylabel('Amplitude');	**Name of the Y label**
grid on;	**This is support line for analyze easily**
xlim([0, 1]);	**Limit the axises and display them**
grid on;	

2. Determine the frequency components present in X (t).

When I searched on internet "How can I find frequency components in a function?" I realized that it can be done with Fourier Transformation. So I researched many websites and seek AI's help.

If we apply the Fourier transformation into the **3cos (2πt) + 2 sin (4πt).**

I found this as general form of sinusoidal function = A cos (2π**f** t) + B sin (2π**g** t).

In our case;

- The coefficient of cosine is **A = 3** and the frequency of this component is **f = 1**.
- The coefficient of sine is **B = 2** and the frequency of this component is **g = 2**.

3. Compute the average power of over one period.

$$P_{\text{avg}} = \frac{1}{T}\int_0^T |x(t)|^2 \, dt$$

This function gives the average power of the periodic signal function. As I found earlier T = 1 second.

This is our integral in order to calculate.

$$P_{\text{avg}} = \frac{1}{1}\int_0^1 |3\cos(2\pi t) + 2\sin(4\pi t)|^2 \, dt$$

When I calculate this integral, I found this answer.

Average Power: **6.5**

***Problem 2: Given the discrete-time signal* x[n] = {1, -2, 3,-4, 5}**

1. Determine the length of the signal.

The length of the x[n] is the number of elements it has. So length is **5**.

2. Find the value of x [3].

X [3] is -4. Because it should be count from 0. So fourth element of this function is **-4**.

3. Compute the sum of all elements in the signal.

Simply sum of all elements of this function is: 1 – 2 + 3 – 4 + 5 = **3**.

4. Calculate the energy of the signal.

$E = \sum_{n=0}^{N-1} |x[n]|^2$ This formula gives us an energy of a discrete-time signal.

When we calculate this integral one by one:

$|1|^2+|-2|^2+|3|^2+|-4|^2+|5|^2$ = 1 + 4 + 9 + 16 + 25 = **55**.