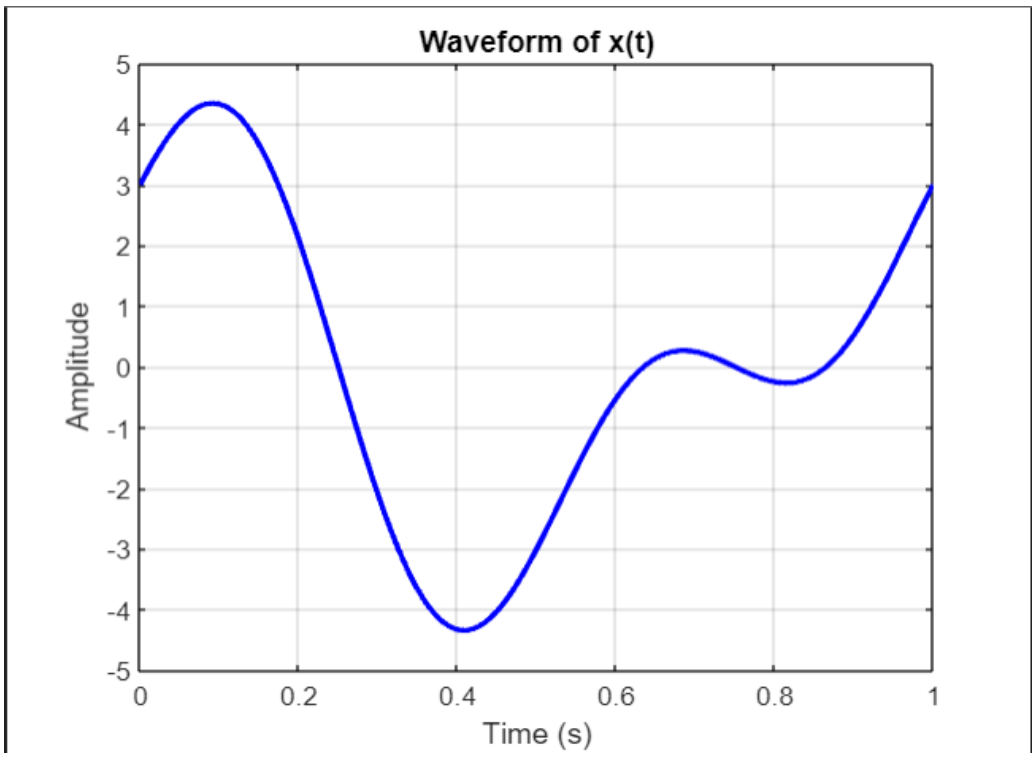
Problem 1: Continuous-Time Signals and Systems

Consider a continuous-time signal $x(t) = 3\cos(2\pi t) + 2\sin(4\pi t)$

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

```
t = linspace(0, 1, 1000);  % Define the time vector
x = 3*cos(2*pi*t) + 2*sin(4*pi*t); % Calculate the signal values

plot(t, x, 'b', 'LineWidth', 2);
xlabel('Time (s)'); % Name the x side of the graph
ylabel('Amplitude'); % Name the y side of the graph
title('Waveform of x(t)'); % Name the title of the graph
grid on; % opens graphic lines
```



Extra Definition

Linespace: linspace is similar to the colon operator

Plot: use to create a graphical representation of some data

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

```
f1 = 1/(2*pi); % Frequency of the cosine component % Define the frequencies
f2 = 1/(4*pi); % Frequency of the sine component

disp(['Frequency component 1: ', num2str(f1), ' Hz']);
disp(['Frequency component 2: ', num2str(f2), ' Hz']);
```

```
Frequency component 1: 0.15915 Hz
Frequency component 2: 0.079577 Hz
```

3. Compute the avaerage power of x(t) over one period.

```
T = 1; % Define the period
x_t = @(t) 3*cos(2*pi*t) + 2*sin(4*pi*t); % Define the signal

integrand = @(t) abs(x_t(t)).^2; % Define the integrand
average_power = 1/T * integral(integrand, 0, T);
disp(['Average Power: ', num2str(average_power)]);
```

```
Average Power: 6.5
```

Extra Definition

İntegrand = a function. Determines the integrator for the integral calculation

average_power = Compute the average power by integrating over one period

disp = Display the result

Problem 2: Discrete-Time Signals and Systems

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

1. Determine the length of the signal

```
x = [1, -2, 3, -4, 5]; % Define the signal

signal_length = length(x); % Determine the length of the signal

disp(['Length of the signal: ', num2str(signal_length)]);
```

```
Length of the signal: 5
```

2. Find The value of x[3].

```
x = [1, -2, 3, -4, 5];
x_3 = x(3); % Find the value of x[3]

disp(['Value of x[3]: ', num2str(x_3)]);
```

```
Value of x[3]: 3
```

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

```
x = [1, -2, 3, -4, 5];

sum_of_elements = sum(x); % Compute the sum of all elements in the signal
disp(['Sum of all elements in the signal: ', num2str(sum_of_elements)]);
```

```
Sum of all elements in the signal: 3
```

4. Calculate the energy of the signal.

```
x = [1, -2, 3, -4, 5];

energy = sum(x.^2); % Calculate the energy of the signal
disp(['Energy of the signal: ', num2str(energy)]);
```

```
Energy of the signal: 55
```

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