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

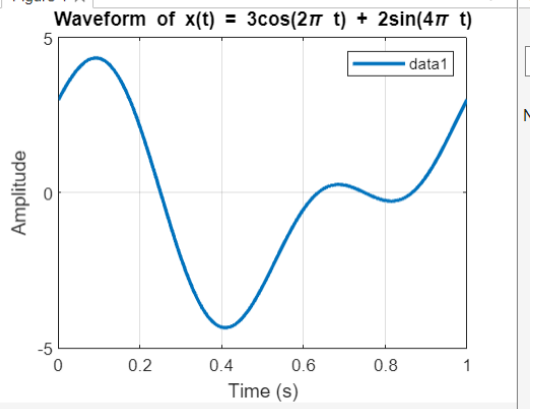
first.m | second.m | third.m | fifth.m | sixth.m | seventh.m

/MATLAB Drive/first.m

```
% I set the time interval for the period
t = linspace(0, 1, 1000);

% I determined the signal x(t)
x_t = 3*cos(2*pi*t) + 2*sin(4*pi*t);

% I drew the graph with plot
plot(t, x_t, 'LineWidth', 2);
title('Waveform of x(t) = 3cos(2\pi t) + 2sin(4\pi t)');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
```



*Linspace(x, y, z) cut is the command used to divide x and y into z equal intervals.

So in that question our x=0, y=1, z=1000.

We defined the time range for one period.

*Now we defined the signal x(t)

The plot command is used to draw 2D graphics in Matlab.

While writing a program, the title command is used to give a name or title to the chart.

The xlabel command is used to give a name to the X axis,

The ylabel command is used to give a name to the Y axis.

If desired, grid lines can be added to the coordinate system with the grid on command. The grid off command is used to remove this added grid.

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

```
% I defined a variable named t
syms t

% I defined the continuous-time signal x(t)
x_t = 3*cos(2*pi*t) + 2*sin(4*pi*t);

% I computed the Fourier transform of x(t)
X_f = fourier(x_t);

% I display the frequency components
disp('Frequency components present in x(t):');
disp(X_f);
```

Command Window

```
>> second
Frequency components present in x(t):
3*pi*(dirac(w - 2*pi) + dirac(w + 2*pi)) - pi*(dirac(w - 4*pi) - dirac(w + 4*pi))*2i

>>
```

$X\_F=3\pi(\delta(w-2\pi)+\delta(w+2\pi))-\pi(\delta(w-4\pi)-\delta(w+4\pi))\cdot 2i$ *->FREQUENCY*

$X\_t= 3\cos(2\pi t)+2\sin(4\pi t)$ ->PERIOT

Fast Fourier Transform (FFT) algorithm is used for discrete-time Fourier transform in MATLAB.

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

```
% Define the continuous-time signal x(t)
x_t = @(t) 3*cos(2*pi*t) + 2*sin(4*pi*t);

% Determine the period T
T = 1; % Since we found the period to be 1

% Define the integrand for the power calculation
integrand = @(t) abs(x_t(t)).^2;

% Use the integral function to compute the integral
avg_power = 1/T * integral(integrand, 0, T);

% Display the result
disp(['Average Power over one period: ', num2str(avg_power)]);

```

Command Window

```
>> third
Average Power over one period: 6.5
>>
```

- **x_t** is a function handle representing the signal.
- **T** is the period of the signal.
- **integrand** is a function handle representing the absolute square of the signal.
- The **integral** function is used to numerically integrate the integrand over the interval [0, T].

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

1)Determine the length of the signal.

```
% Given signal
x_n = [1, -2, 3, -4, 5];

signal_length = length(x_n);

% Result
disp(['The length of  signal: ', num2str(signal_length)]);

```

Command Window

```
>> sixth
The length of  signal: 5
>>
```

In this code:

- **x_n** is the given discrete-time signal.
- The **length** function is used to find the number of elements in the signal.

2) Find the value of x[3].

/MATLAB Drive/fifth.m

```
1   % Given discrete-time signal
2   x_n = [1, -2, 3, -4, 5];
3
4   % Find the value of x[3]
5   x_3 = x_n(3);
6
7   % Display the result
8   disp(['Value of x[3]: ', num2str(x_3)]);
9
10
```

Command Window

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

In this code, **x_n(3)** extracts the value of the third element in the vector **x_n**

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

```
% Given discrete-time signal
x_n = [1, -2, 3, -4, 5];

% Compute the sum of all elements in the signal
sum_of_elements = sum(x_n);

% Display the result
disp(['Sum of all elements in the signal: ', num2str(sum_of_elements)]);

```

Command Window

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

4) Calculate the energy of the signal.

/MATLAB Drive/seventh.m

```
% Given discrete-time signal
x_n = [1, -2, 3, -4, 5];

% Calculate the energy of the signal
energy = sum(abs(x_n).^2);

% Display the result
disp(['Energy of the signal: ', num2str(energy)]);

```

Command Window

```
>> seventh
Energy of the signal: 55
>>
```

x_n = [1, -2, 3, -4, 5];

energy = sum(abs(x_n).^2) ->This line calculates the energy of the signal.

disp(['Energy of the signal: ', num2str(energy)]);

This line displays the calculated energy of the signal using **disp**. The result is shown as a string indicating the energy value.