

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.
2. Determine the frequency components present in $x(t)$.
3. Compute the average power of $x(t)$ over one period.

```
% problem 1: Continuous-Time Signals and Systems
```

```
% signal
```

```
t = linspace(-2, 2, 1000);
```

```
xt = 3*cos(2*pi*t) + 2*sin(4*pi*t);
```

```
% sketch
```

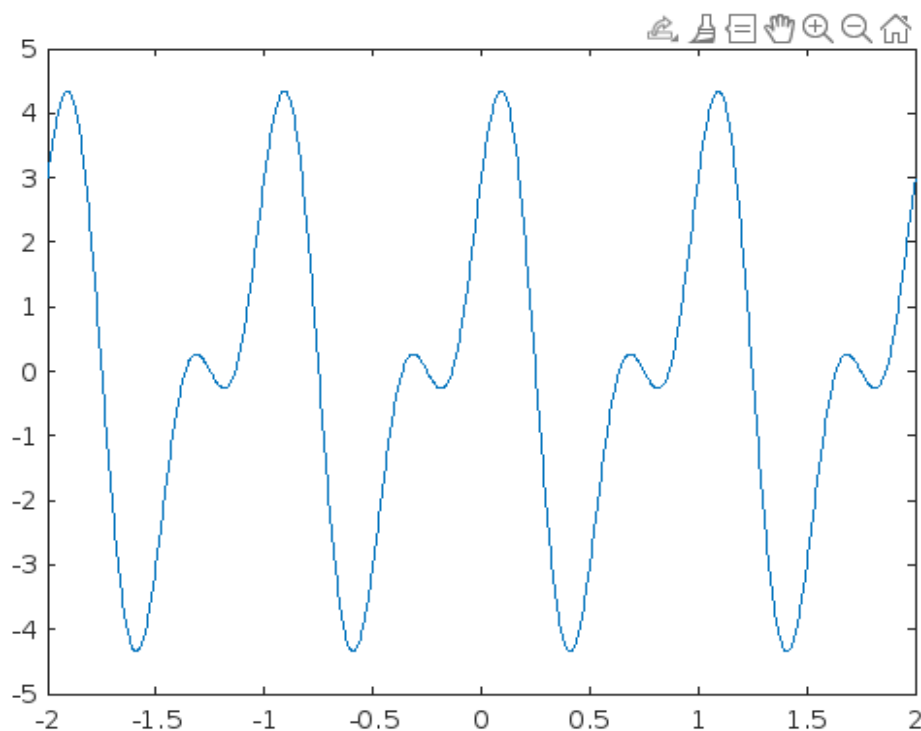
```
figure('Name','Continuous Signal Sketch');
```

```
grid on;
```

```
plot(t, xt);
```

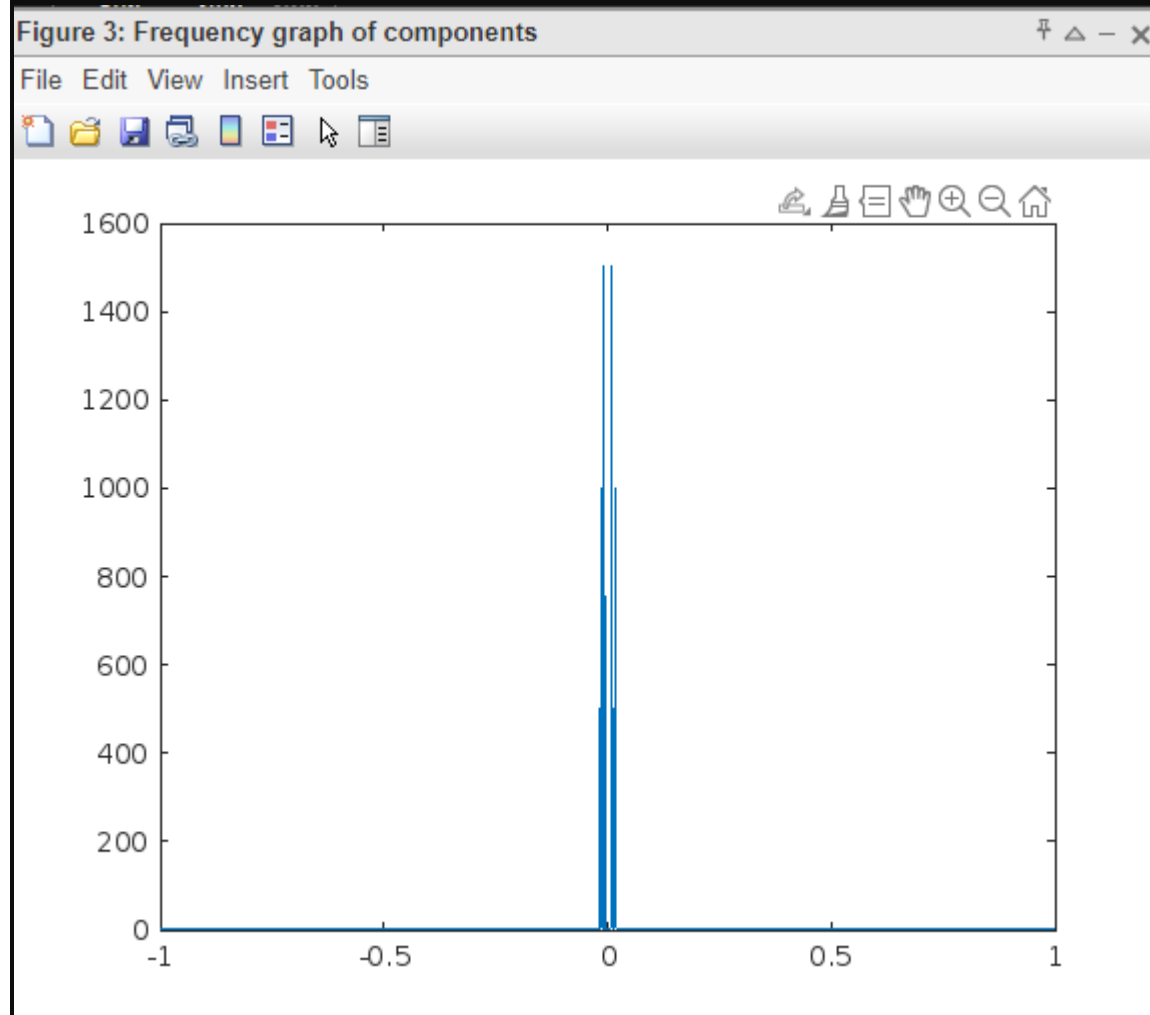
Figure 1: Continuous Signal Sketch

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```
% frequency of components
fftr = fft(xt);
freq = linspace(-1, 1, length(fftr));

figure('Name', 'Frequency graph of components');
plot(freq, abs(fftshift(fftr)))
```



```
% average power of xt over one period = 6.5
period = 1;
powerXt = (1/period) * trapz(t, xt.^2);
fprintf("Average power of xt over one period: %f\n", powerXt)
```

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.
2. Find the value of $x[3]$.
3. Compute the sum of all elements in the signal.
4. Calculate the energy of the signal.

```
% problem 2: Discrete-Time Signals and Systems

% signal
xn = [1, -2, 3, -4, 5];

% signal length = 5
fprintf("Discrete Signal Length: %d\n", length(xn))

% value of xn[3] = 3
fprintf("Value of xn[3]: %d\n", xn(3));

% sum of elements in signal = 3
fprintf("Sum of elements in signal: %d\n", sum(xn));

% energy of signal = 55
fprintf("Energy of signal: %d\n", sumsqr(xn));
```