COE 472: Digital Signal Processing

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## LAB 1

### 3.0 Manipulating Sinusoids with MATLAB

a. Generated a time vector tt that covers cycles of a 4000Hz sinusoid. The period T is 1/f where f is the frequency.

```
f = 4000; % Frequency in Hz
T = 1 / f; % Period of the sinusoid
samples_per_period = 25; % At least 25
samples per period
dt = T / samples_per_period; % Time
increment
tt = -T : dt : T; % Time vector covering
two cycles
```

b. The sinusoids x1(t) and x2(t) are generated with arbitrary amplitudes and time-shifts. The amplitude A1 is set to my age and A2 = 1.2 * A1. The time-shifts tm1 and tm2 are calculated based on my birthday.

```
A1 = 23;
A2 = 1.2 * A1; % Amplitude for the second sinusoid
D = 16;
M = 10;
% Calculate time shifts
tm1 = (37.2 / M) * T;
tm2 = -(41.3 / D) * T;

% Generate the sinusoids
x1 = A1 * cos(2 * pi * f * (tt - tm1));
x2 = A2 * cos(2 * pi * f * (tt - tm2));

figure;
subplot(3, 1, 1);
plot(tt, x1, 'b-');
title('Signal x1(t) - [Your Name]');
xlabel('Time (sec)');
ylabel('Amplitude');
grid on;
```

```
subplot(3, 1, 2);
plot(tt, x2, 'r--');
title('Signal x2(t)');
xlabel('Time (sec)');
ylabel('Amplitude');
grid on;
```

c. The third sinusoid x3(t) is the sum of x1(t) and x2(t)

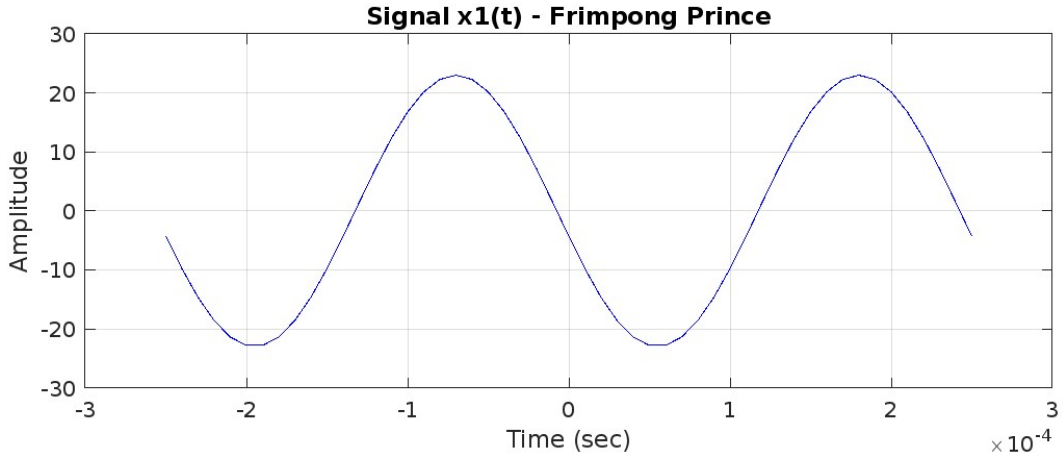
```
x3 = x1 + x2;

% Plot the third signal
subplot(3, 1, 3);
plot(tt, x3, 'k-');
title('Sum of Signals x3(t)');
xlabel('Time (sec)');
ylabel('Amplitude');
grid on;
```

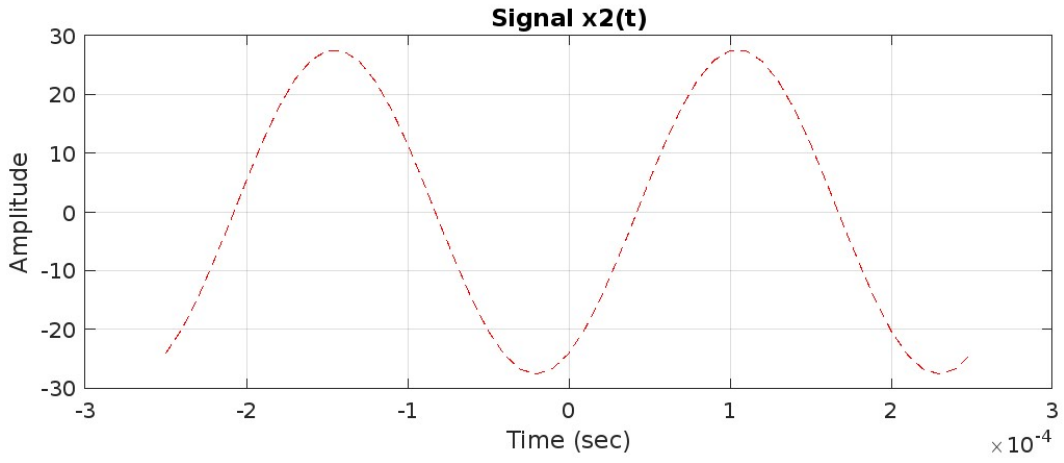
**3.1 Theoretical Calculations**

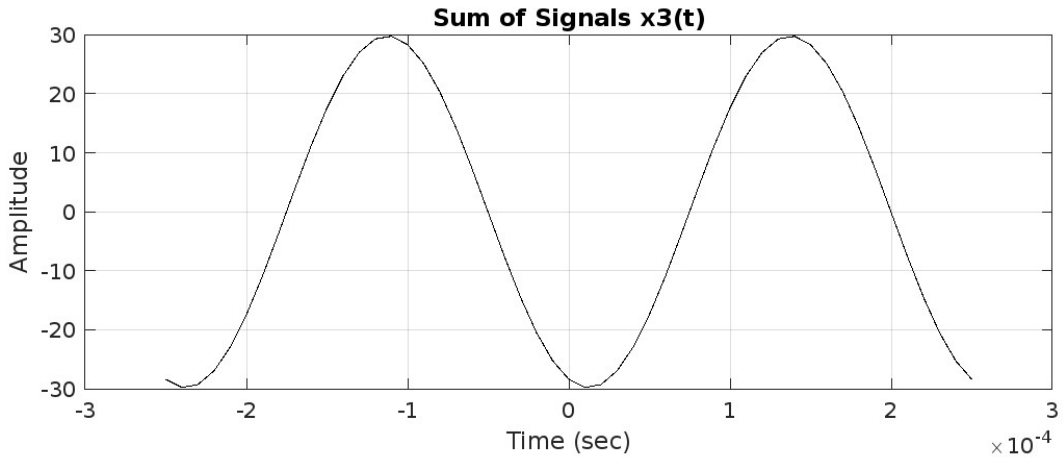
```
A1=21.9,A2=26.36,tm1=0.0093,tm2=0.00258,A3=5.796
```

**3.2 Complex Amplitude**

```
xx1_complex=real(A1*exp(1i*2 *pi*4000*(tt-tm1)));
```


Signal x1(t) - Frimpong Prince
Amplitude
Time (sec)
×10^-4


Signal x2(t)
Amplitude
Time (sec)
×10^-4


Sum of Signals x3(t)
Amplitude
Time (sec)
×10^-4