

Performance Task for Lab Report: (your ID = AB-CDEFG-H)

**\*\*Generate two CDEF hertz sinusoids with different amplitudes and phases.**

$$x_1(t) = A_1 \cos(2\pi(\text{CDEF})t + j_1) \quad x_2(t) = A_2 \cos(2\pi(\text{CDEF})t + j_2)$$

(a) Select the value of the amplitudes as follows: let  $A_1 = \text{AB}$  and  $A_2 = \text{GH}$ . For the phases, use  $j_1$

$= \text{DG}$  (in degrees), and take  $j_2 = 30^\circ$ . When doing computations in Matlab, make sure to convert degrees to radians.

ID : 22-47018-1 (AB-CDEFG-H)

AB = 22(A1), GH = 81 (A2)

CDEF = 4701 (F)

DG = 78 (J1)

J2 = 30

(b) Make a plot of both signals over a range of  $t$  that will exhibit approximately 3 cycles. Make sure the plot starts at a negative time so that it will include  $t = 0$ , and make sure that you have at least 20 samples per period of the wave.

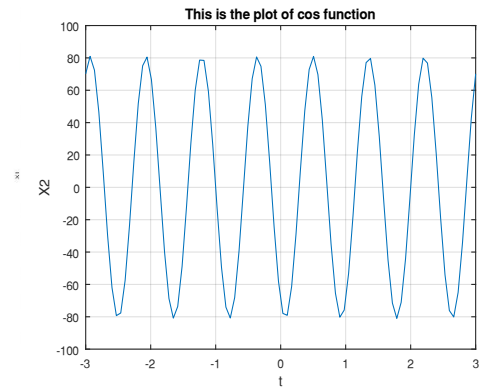
MATLAB Code	Figure
<pre>%{ ID = 22-47018-1 AB-CDEFG-H AB = 22 GH = 81 CDEF = 4701 DG = 78 %} t = linspace(-3, 3, 90); CDEF = 4701; A1 = 22; ph_deg01 = 78; ph_rad01 = deg2rad(ph_deg01); x1 = A1*sin(2*pi*CDEF*t + ph_rad01); figure; plot(t, x1)</pre>	

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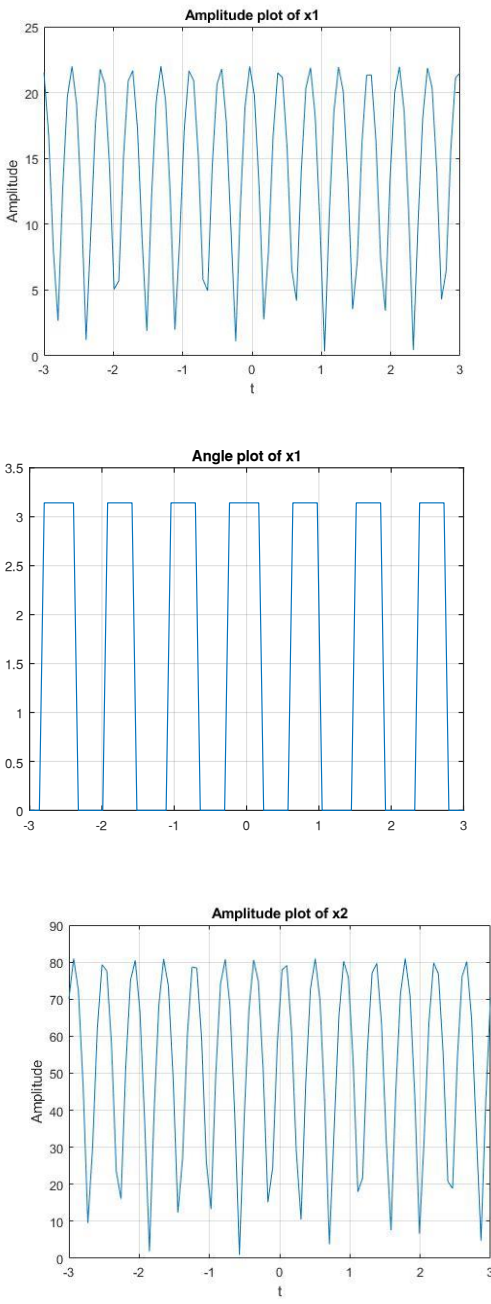
xlabel('t')
ylabel('X1')
title('This is plot of sin
function')
grid on;

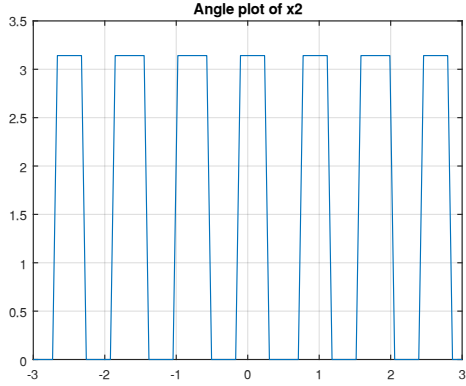
%{
ID = 22-47018-1 AB-CDEFG-H
AB = 22
GH = 81
CDEF = 4701
DG = 78
%}
A2 = 81;
ph_deg02 = 30;
ph_rad02 = deg2rad(ph_deg02);
x2 = A2*cos(2*pi*CDEF*t +
ph_rad02);
figure;
plot(t, x2)
xlabel('t')
ylabel('X2')
title('This is the plot of cos
function')
grid on;

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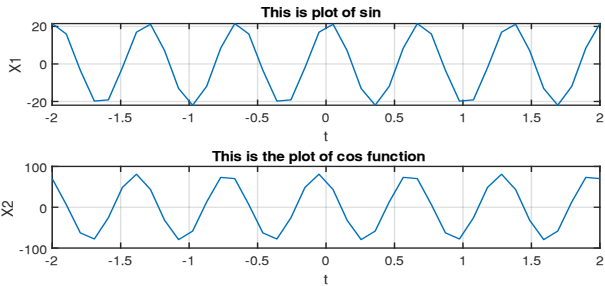


(c) erify that the phase of the two signals  $x_1(t)$  and  $x_2(t)$  is correct at  $t = 0$ , and also verify that each one has the correct maximum amplitude.

MATLAB Code	Output Figure
<pre> %{ ID = 22-47018-1 AB-CDEFG-H AB = 22 GH = 81 CDEF = 4701 DG = 78 %} t = linspace(-3, 3, 90); CDEF = 4701; A1 = 22; ph_deg01 = 78; ph_rad01 = deg2rad(ph_deg01); x1 = A1*sin(2*pi*CDEF*t + ph_rad01); figure; plot(t, abs(x1)) title('Amplitude plot of x1') ylabel('Amplitude') xlabel('t') grid on;  figure; plot(t, angle(x1)) title('Angle plot of x1') grid on  %{ ID = 22-47018-1 AB-CDEFG-H AB = 22 GH = 81 CDEF = 4701 DG = 78 %} A2 = 81; ph_deg02 = 30; ph_rad02 = deg2rad(ph_deg02); x2 = A2*cos(2*pi*CDEF*t + ph_rad02); figure; </pre>	 <p>The output figure consists of three subplots arranged vertically. The top subplot, titled 'Amplitude plot of x1', shows the absolute value of the signal x1 over time t from -3 to 3. The y-axis is labeled 'Amplitude' and ranges from 0 to 25. The signal is a periodic waveform with a peak amplitude of approximately 22. The middle subplot, titled 'Angle plot of x1', shows the phase angle of the signal x1 over time t from -3 to 3. The y-axis ranges from 0 to 3.5. The signal is a periodic square wave that alternates between approximately 3.14 and 0. The bottom subplot, titled 'Amplitude plot of x2', shows the absolute value of the signal x2 over time t from -3 to 3. The y-axis is labeled 'Amplitude' and ranges from 0 to 90. The signal is a periodic waveform with a peak amplitude of approximately 81.</p>

<pre> plot(t, abs(x2)) title('Amplitude plot of x2') ylabel('Amplitude') xlabel('t') grid on  figure; plot(t, angle(x2)) title('Angle plot of x2') grid on </pre>	
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(d) Use subplot(3,1,1) and subplot(3,1,2) to make a three-panel subplot that puts both of these plots on the same window. See help subplot.

MATLAB Code	Output Figure
<pre> %{ ID = 22-47018-1 AB-CDEFG-H AB = 22 GH = 81 CDEF = 4701 DG = 78 }% t = linspace(-2, 2,40); CDEF = 4701; A1 = 22; ph_deg01 = 78; ph_rad01 = deg2rad(ph_deg01); x1 = A1*sin(2*pi*CDEF*t + ph_rad01); subplot(3, 1, 1) plot(t, x1) xlabel('t') ylabel('X1') title('This is plot of sin') grid on; %{ ID = 22-47018-1 AB-CDEFG-H AB = 22 </pre>	

<pre> GH = 81 CDEF = 4701 DG = 78 %} A2 = 81; ph_deg02 = 30; ph_rad02 = deg2rad(ph_deg02); x2 = A2*cos(2*pi*CDEF*t + ph_rad02); subplot(3, 1, 2) plot(t, x2) xlabel('t') ylabel('X2') title('This is the plot of cos function') grid on; </pre>	
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(e) Create a third sinusoid as the sum:  $x_3(t) = x_1(t) + x_2(t)$ . In Matlab this amounts to summing the

vectors that hold the samples of each sinusoid. Make a plot of  $x_3(t)$  over the same range of time as used in the previous two plots. Include this as the third panel in the window by using subplot (3,1,3).

MATLAB Code	Figure
<pre> %{ ID = 22-47018-1 AB-CDEFG-H AB = 22 GH = 81 CDEF = 4701 DG = 78 %} t = linspace(-2, 2,40); CDEF = 4701; A1 = 22; ph_deg01 = 78; ph_rad01 = deg2rad(ph_deg01); x1 = A1*sin(2*pi*CDEF*t + </pre>	

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ph_rad01);
subplot(3, 1, 1)
plot(t, x1)
xlabel('t')
ylabel('X1')
title('This is plot of sin')
grid on;

%{
ID = 22-47018-1 AB-CDEFG-H
AB = 22
GH = 81
CDEF = 4701
DG = 78
%}
A2 = 81;
ph_deg02 = 30;
ph_rad02 = deg2rad(ph_deg02);
x2 = A2*cos(2*pi*CDEF*t +
ph_rad02);
subplot(3, 1, 2)
plot(t, x2)
xlabel('t')
ylabel('X2')
title('This is the plot of
cos function')
grid on;

x3 = x1 + x2;
subplot(3, 1, 3);
plot(t, x3, 'r');
xlabel('t')
ylabel('x3')
title('This is x3 = x1 +
x2')
grid on

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