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Engineering 103 –UMass Boston

CW 11

(In-Class-Work 11)

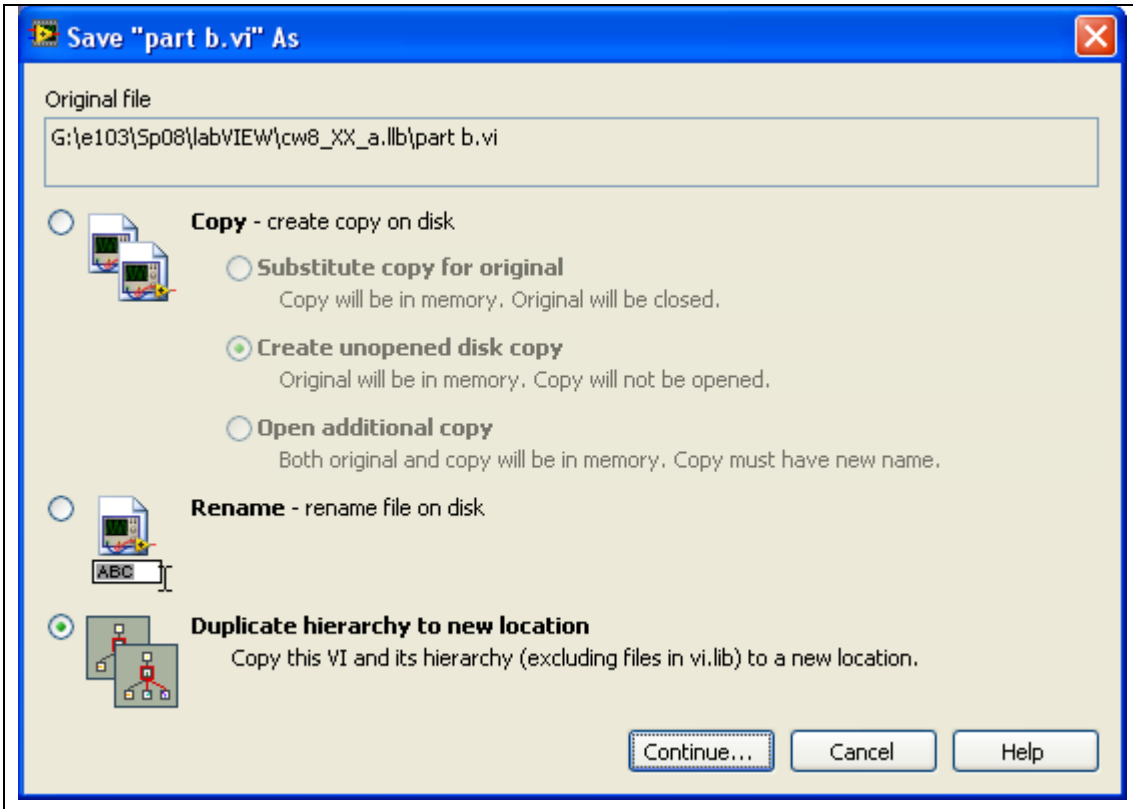
Plotting two sinusoids with arbitrary frequencies, their sum, and spectrum.

Starting with the LabVIEW Virtual Instrument (VI) to plot a function in CW9, create a modified VI that allows the user to change the frequency of the sinusoids within the Front Panel. Use one Waveform Graph for the two sinusoids, another for their sum, and a third one for their Spectrum. Use "FFT.vi" to compute the spectrum of the combined signal, then takes the absolute value to plot.

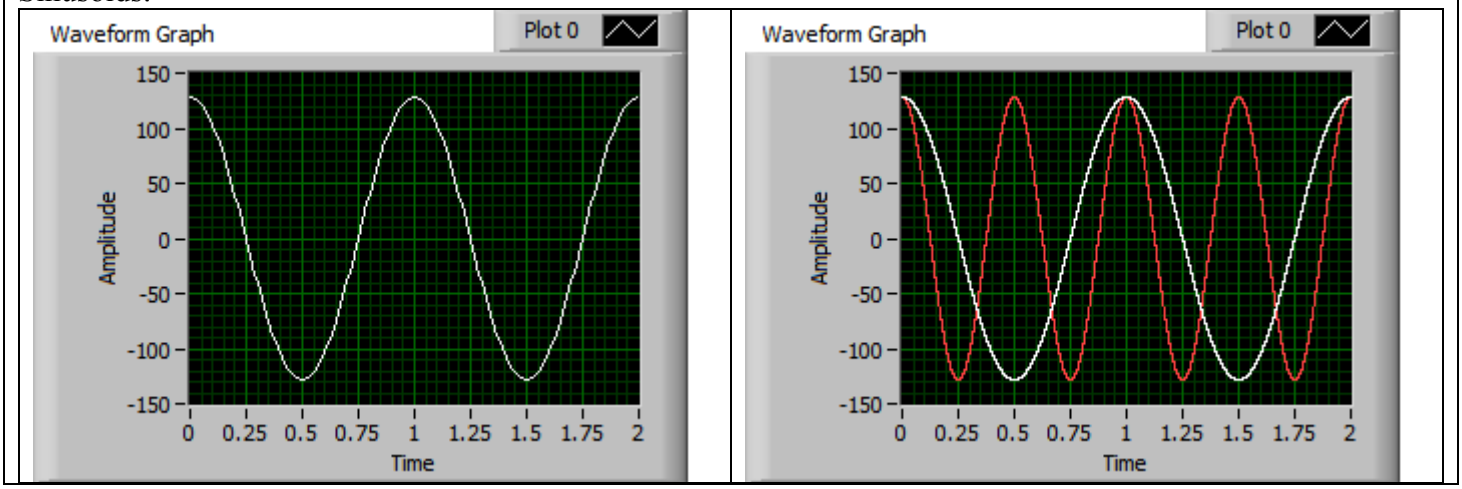
Please insert names and dates within the Front Panels. In each team, students working together at a computer numbered between 1 and 10 will submit LabVIEW LLB file cw11_XX_a.llb, students working at a computer numbered between 11 and 20 will submit LabVIEW LLB file cw11_XX_b.llb, to the *files* folder in the server. Replace XX by 01 if team 1, etc. These files need to be uploaded to the server today to receive credit. Include your names within the files.

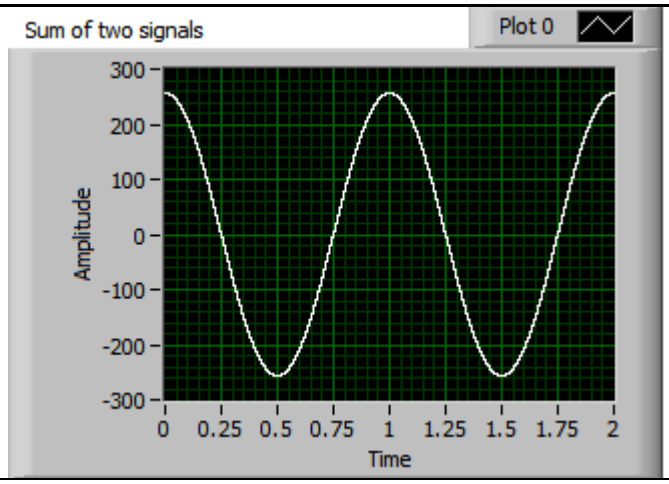
*Remember that this is an individual work (turn it in, as instructed, with your name and date). Home-works and class-works count 20% toward the course grade. Class-works are done in class.

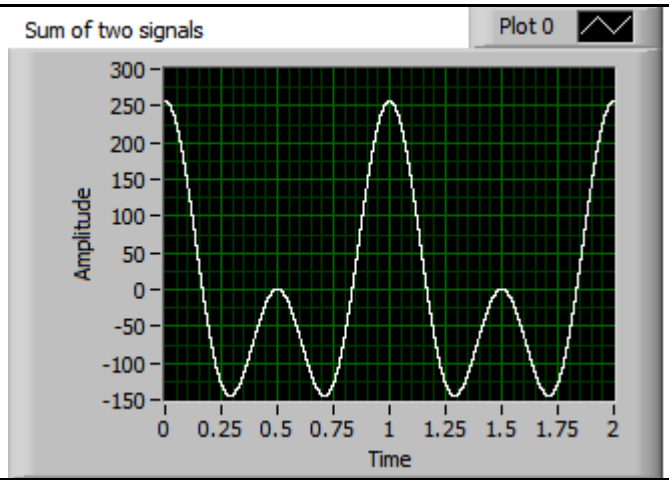
Once you have opened the LLB file for CW9, to save it as a new LLB file for CW11, use Save As, then select Duplicate Hierarchy to New Location as shown below

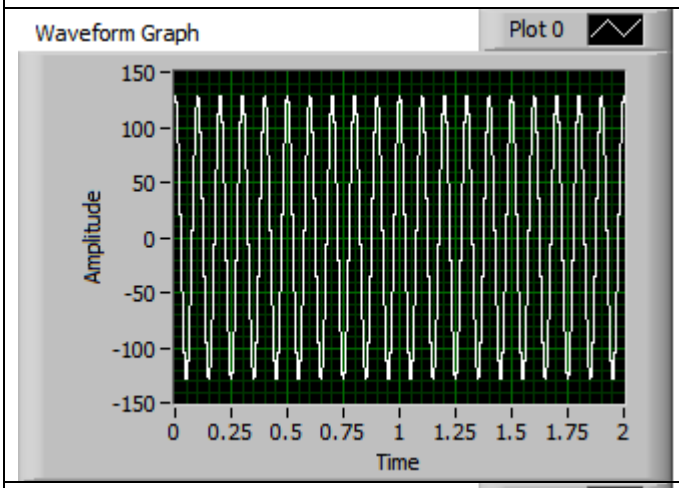

Save "part b.vi" As
Original file
G:\e103\Sp08\labVIEW\cw8_XX_a.llb\part b.vi
Copy - create copy on disk
Substitute copy for original
Copy will be in memory. Original will be closed.
Create unopened disk copy
Original will be in memory. Copy will not be opened.
Open additional copy
Both original and copy will be in memory. Copy must have new name.
Rename - rename file on disk
ABC
Duplicate hierarchy to new location
Copy this VI and its hierarchy (excluding files in vi.lib) to a new location.
Continue...
Cancel
Help

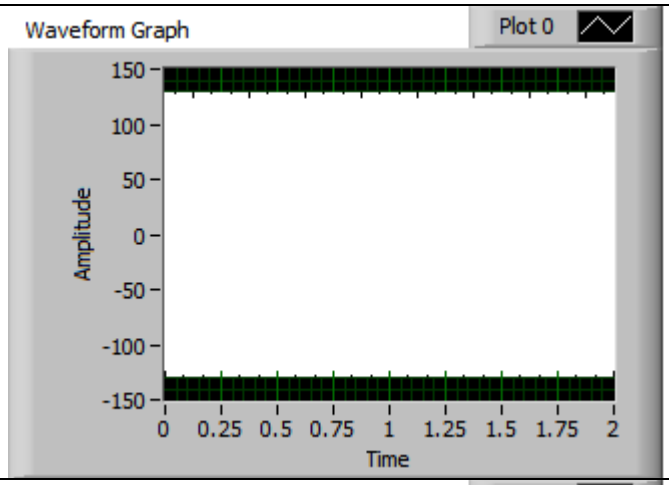
Sinusoids:

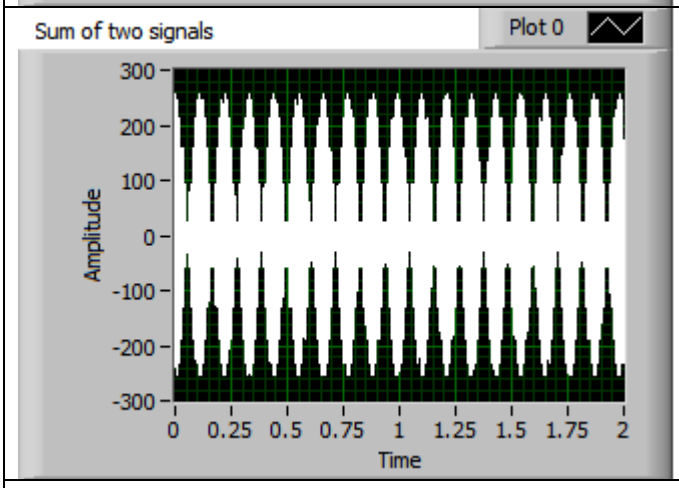

Waveform Graph
Plot 0
Amplitude
Time
150
100
50
0
-50
-100
-150
0
0.25
0.5
0.75
1
1.25
1.5
1.75
2
Waveform Graph
Plot 0
Amplitude
Time

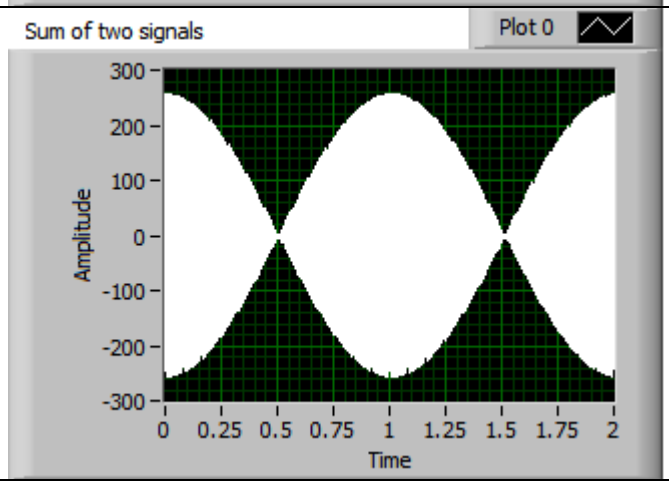












Period T: time separation between consecutive peaks or troughs (time to complete one cycle)
Linear frequency f=1/T or number of cycles per second

$$A\cos(\omega \cdot t) = A\cos\left(\frac{2\pi\, t}{T}\right)$$

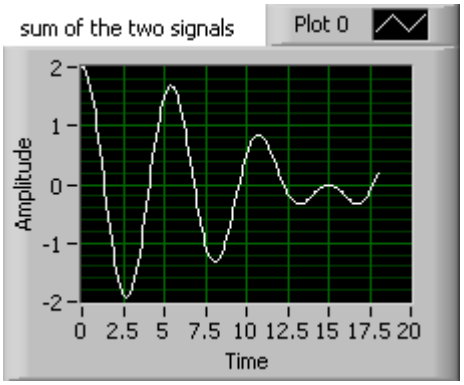
A=Amplitude

ω= Angular frequency; ω=2πf=2π/T

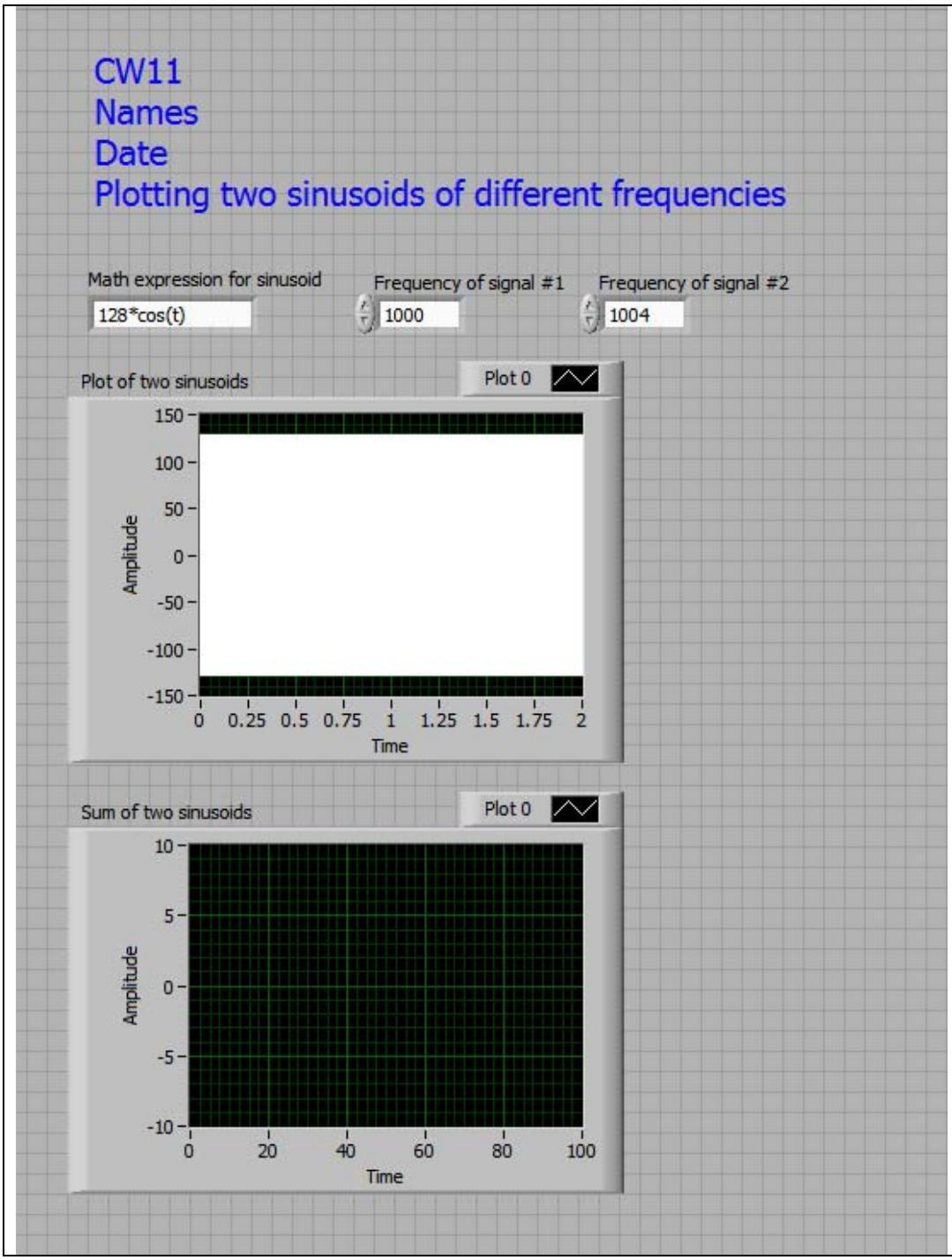
	$A\cos\left(\frac{2\pi\, t}{T}\right)$	cos(t) (Plotted in CW9)
Amplitude	A	1
Period	T	T=2π
Angular frequency	$\frac{2\pi}{T}$	1

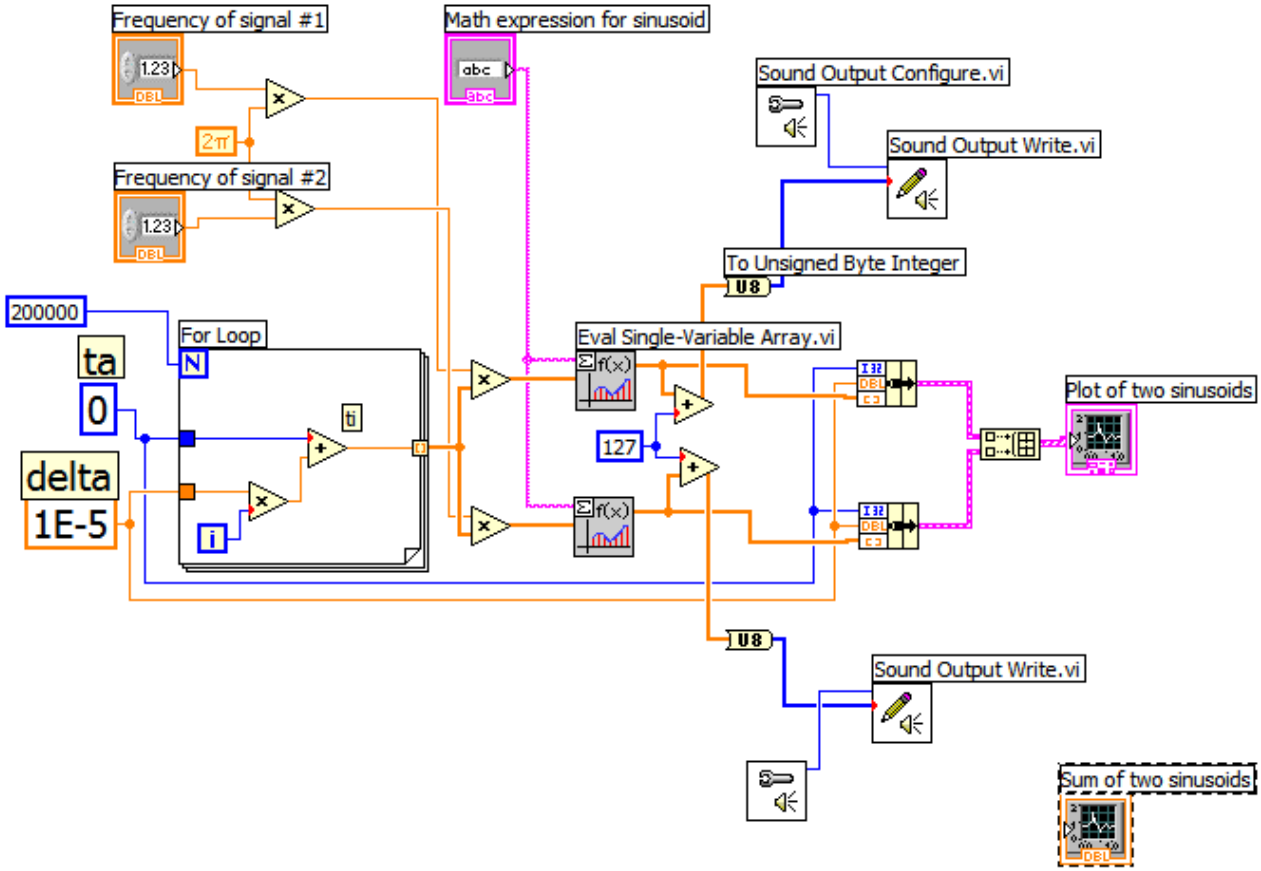
We will modify the VI for CW9 so the user can choose an angular frequency (or a period).

Spectrum: distribution of different frequency components of a signal



There are two frequency components in this signal, its spectrum will show two peaks


CW11
Names
Date
Plotting two sinusoids of different frequencies
Math expression for sinusoid
128*cos(t)
Frequency of signal #1
1000
Frequency of signal #2
1004
Plot of two sinusoids
Plot 0
150
100
50
0
-50
-100
-150
Amplitude
0
0.25
0.5
0.75
1
1.25
1.5
1.75
2
Time
Sum of two sinusoids
Plot 0
10
5
0
-5
-10
Amplitude
0
20
40
60
80
100
Time



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Project 3

Section 1

Team	*Team leader*	*Assignment*
1		
2		
3		
4		
5		
6		

7	
8	
9	

Section 2

Team	*Team leader*	*Assignment*
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

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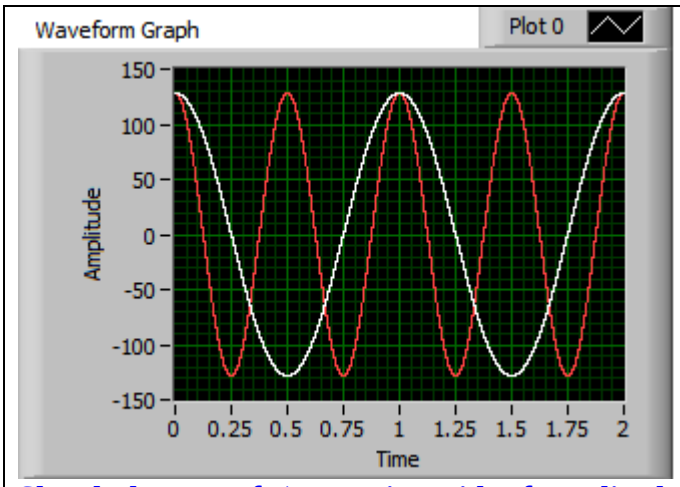
LOGBOOK: example of a logbook page

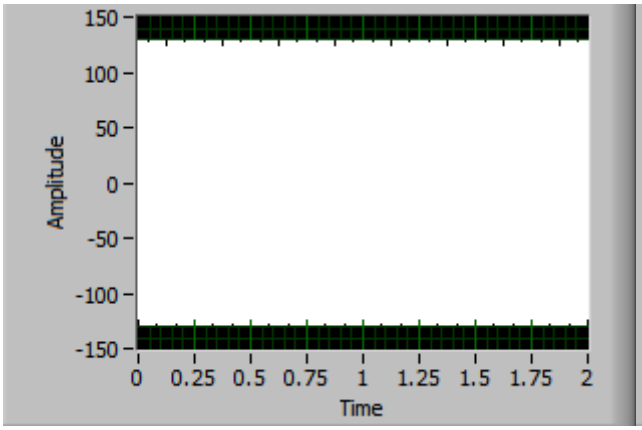
-Use a quadrille notebook; number all pages; date all entries
-Write your notes for all activities, thoughts, problems and solutions, and learning conclusions related to Engin 103. You should write down progress, outcomes, and conclusions on projects and teamwork; conclusions from class work (including LabVIEW) and homework.
-In addition you should answer in the logbook all questions listed in these notes in blue, as shown below:

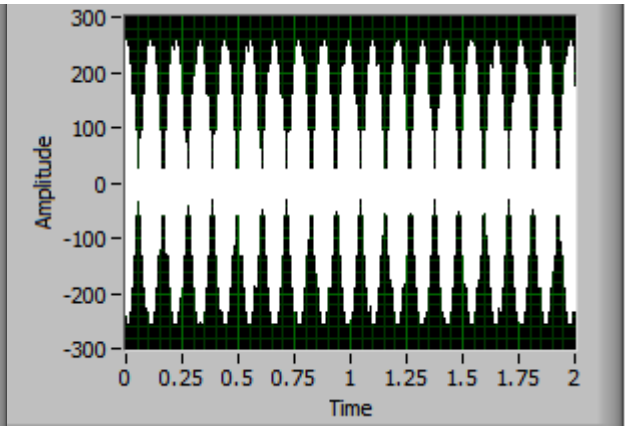
43) What are the amplitude, period T, and linear frequency f=1/T for the two sinusoid (white and red) in the figure below.



Sketch the sum of a) Two sinusoids of amplitude 10, and linear frequency 2 Hz b) Two sinousoids, one of linear frequency 1Hz, the other of linear frequency 2 Hz, both of amplitude 10.

44) If both figures below show the sum of two sinusoids, which one represent audible beats, and what are the conditions on the amplitudes and frequencies of the combining sinusoids for this to happen?





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