

**The George Washington University**  
**School of Engineering and Applied Science**  
**Department of Electrical and Computer Engineering**  
**ECE 002 - LAB**  
**Homework # 4**

*Oscilloscope/Matlab Assignment*

**Instructions:** This homework is to be completed **AFTER** you have completed the oscilloscope lab.

You will need to visit the Tompkin's 3<sup>rd</sup> floor labs and use an oscilloscope on your own to complete this HW. Refer to the oscilloscope presentation given in lecture #5 to help you with this HW.

You will also need to go to Tompkin's 4<sup>th</sup> floor and use a lab computer with **Matlab** to complete this assignment.

1. Using the function generator on the analog oscilloscope, follow these setup instructions and then answer the questions that follow:

*Setup:*

Step 1: Set the wave function to triangle.

Step 2: Set the frequency range to 1M

Step 3: Turn the frequency scaling dial all of the way counterclockwise.

Step 4: Turn the amplitude dial all of the way clockwise.

(Note: If the resulting wave is not in the shape of a triangle, adjust the DC-Offset until it takes that shape)

*Questions:*

a. Draw the waveform you see on the scope, including axis divisions & labels below. Label the time & voltage value for each vertical and horizontal division.

b. What is the Peak to Peak Voltage? What is the amplitude of the waveform?

c. What is the Period of one Cycle? What is the frequency of the wave? Include the UNITS for each.

Note: Homework is to be done individually and violation of the GWU academic integrity code will be reported to GWU Office of Academic Integrity.

- Using the function generator on the analog oscilloscope, follow these setup instructions and then answer the questions that follow:

*Setup:*

Step 1: Set the wave function to sinusoidal.

Step 2: Set the frequency range to 100K

Step 3: Turn the frequency scaling dial all of the way clockwise.

Step 4: Turn the amplitude dial all of the way counterclockwise.

*Questions:*

a. Draw the waveform you see on the scope, including axis divisions & labels below. Label the time & voltage value for each vertical and horizontal division.

b. What is the Peak to Peak Voltage? What is the amplitude of the waveform?

c. What is the Period of one Cycle? What is the frequency of the wave? Include the UNITS for each.

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3. Given the following system of equations, use Matlab, solve for three unknowns (x, y, & z)

$$\begin{aligned}x + 2y &= 20 \\2x + 5y - z &= 35 \\4x + 10y - z &= 45\end{aligned}$$

Note: these equations can be rewritten in matrix form as

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 5 & -1 \\ 4 & 10 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 20 \\ 35 \\ 45 \end{bmatrix}$$

**ANSWER:**

x =

y =

z =

In addition: submit a Matlab .m file showing how you used Matlab to solve for x,y, & z

*Forgotten how to use Matlab? Use the following references from SEAS 001 to remember:*

<http://www.seas.gwu.edu/~seas001/fall07/week2/>

[http://www.seas.gwu.edu/~seas001/fall07/week1/week1\\_lab\\_handout\\_matlab\\_howto.ppt](http://www.seas.gwu.edu/~seas001/fall07/week1/week1_lab_handout_matlab_howto.ppt)

[http://www.seas.gwu.edu/~seas001/fall07/week2/week2\\_lab\\_handout\\_matlab.doc](http://www.seas.gwu.edu/~seas001/fall07/week2/week2_lab_handout_matlab.doc)

[http://www.seas.gwu.edu/~seas001/fall07/week2/week2\\_lab\\_exercise\\_matlab.doc](http://www.seas.gwu.edu/~seas001/fall07/week2/week2_lab_exercise_matlab.doc)

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