MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EE101: Introduction to Electrical and Electronics Engineering
MATLAB Hands-on Exercise Session Report

Name : Alperen Öztürk
Student ID : 2575868

Part I: Overview of Basic Tools

- Write down the values of ***m*** and ***n*** and briefly explain what they represent.

The values of m and n represent the index values of the elements that are equal to 0 in A matrix, and here the m represents the row indices , n represent the column indices of each element.

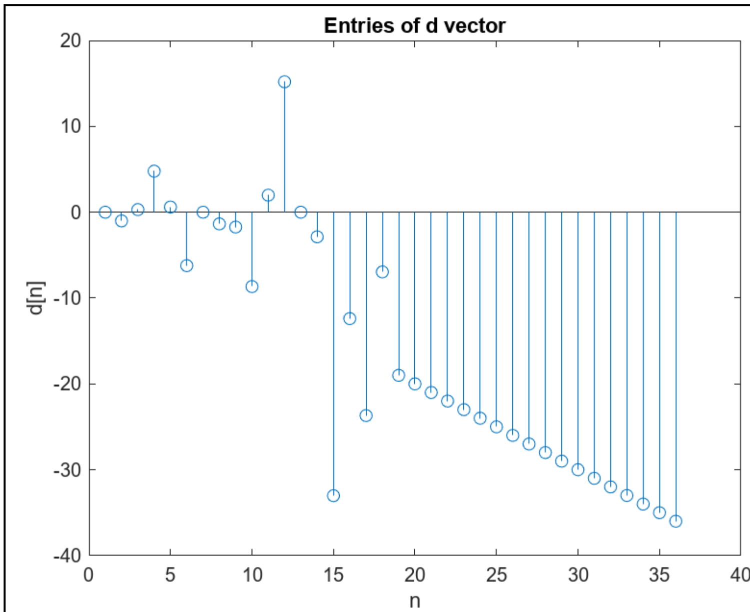
For example, the second entry of A that is equal to 0 is in the first row, and in the second column. Because of that, first value of m is 1 and first value of n is 2.

- Comment on the difference between the two product operators “ * ” and “ .* ”.

* is used for matrix multiplications.

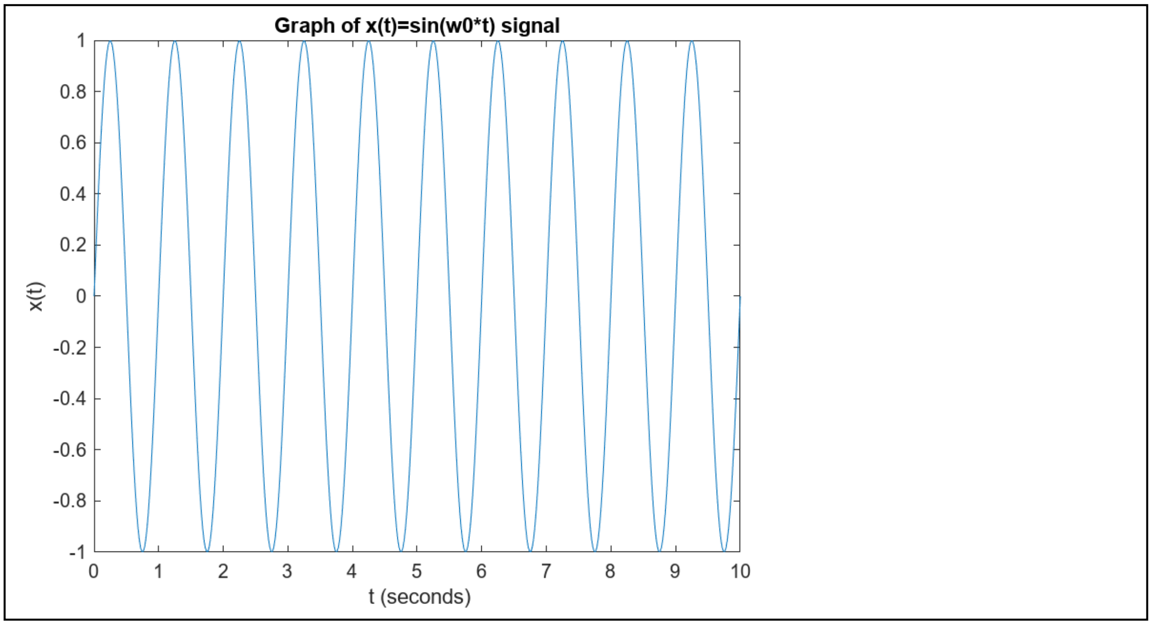
.* is used for element-wise multiplications. For example, $A_{xy} * B_{xy}$

- Insert the plot you saved in Part I Ex. 10 below.

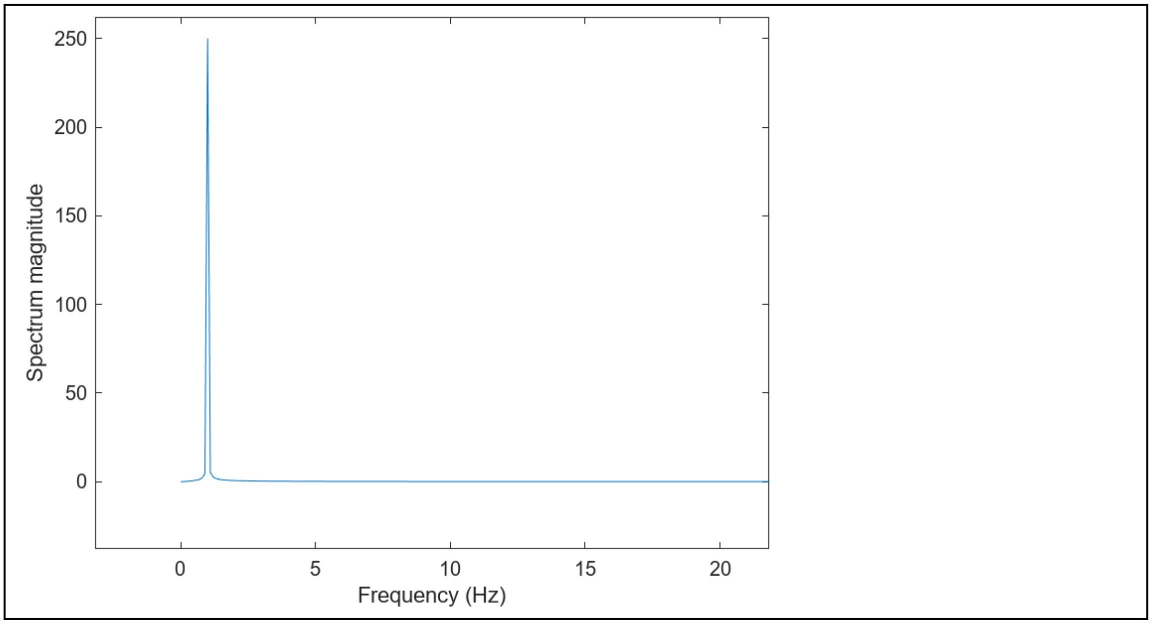


Part II: Frequency Analysis of Sinusoidal Signals

- Insert the plot you saved in Part II Ex. 2 below.



- Insert the spectrum plot you saved in Part II Ex. 5 below.



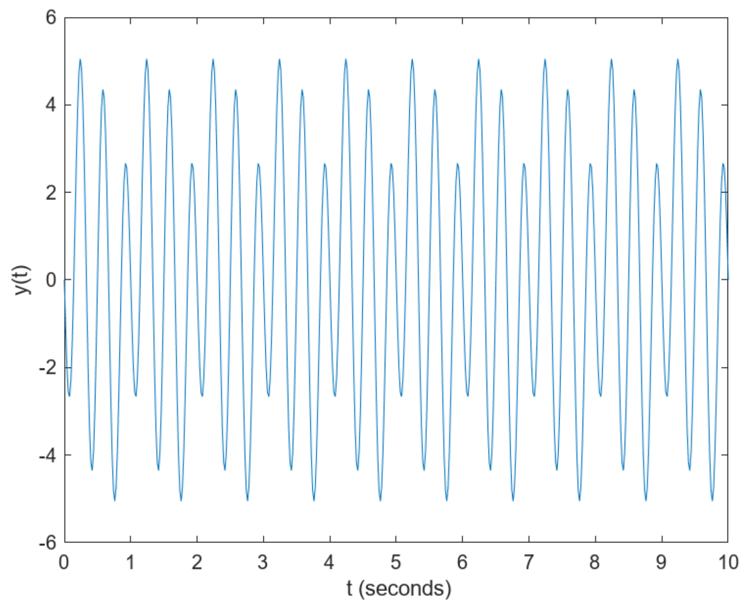
- Can you approximately spot the dominant frequency ***f₀*** in the signal ***x***? Interpret this by remembering that our signal is $x(t) = \sin(\omega_0 t)$. What is the relation between $\boldsymbol{\omega_0}$ (the angular frequency in radians per second) and $\boldsymbol{f_0}$ (the frequency in Hertz)?

Dominant frequency is approximately 1 Hz. The relation between ω_0 and f_0 is, $\omega_0 = 2*\pi* f_0.$

- Report the dominant frequencies in the signal ***x*** and comment on the result. Is the function output consistent with the frequency $\boldsymbol{f_0}$ you determined in part 5?

There is just one dominant frequency in the signal x and it is 0.998 Hz. It shows that it is consistent with the dominant frequency I determined in part 5.

- Insert the plot of ***y(t)*** you saved in Part II Ex. 8 below.



- In what way do ***x(t)*** and ***y(t)*** have similar and different characteristics?

They both have sinusoidal characters; however, y(t) consist 3 different sinusoids.

Y-Axis limits of y(t) are 6 and -6,but since there is no such t that makes the first two elements of y equal to 1 and last element equal to -1, y(t) never reach 6 and -6.

Y-Axis limits of x(t) are 1 and -1 and x(t) which consists one sinus function, and x(t) oscillates between 1 and -1

- Inspect the spectrum of ***y(t)*** and comment. What are the dominant frequencies in ***y(t)*** in units of Hz? Comment on how these are related to the angular frequencies w_0, $2w_0$, $3w_0$ of the three sinusoids making up the signal.

There are 3 peaks on the spectrum of y(t),and they represent the 3 different dominant frequencies. These frequencies are 0.9980 Hz, 1.9960 Hz, 2.9940 Hz, and they are directly proportional with the angular frequencies w_0, $2w_0$, $3w_0$. This proportion results from the formula $\omega_0 = 2*\pi* f_0$. When the angular frequency is multiplied by a constant, so does the frequency must be multiplied by that constant.