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**Assignment 2**

**Problem 1:**

I generated samples using the following function:

x[n] = (sin(2\*π\*n / 40) + 2 sin(2\*π\*n / 16)) exp(-((n-128) / 64)2)

then I ploted them using python

Chart, line chart

Description automatically generated

**Problem 2:**

I calculated the imaginary part by the equations:

X (m)=

And I Plotted the real and imaginary parts

**Chart, box and whisker chart

Description automatically generatedChart, shape, rectangle

Description automatically generatedChart, box and whisker chart

Description automatically generatedChart, box and whisker chart

Description automatically generated**

**Problem 3:**

In order to convert the frequency spectrum into polar form, I calculated the magnitude and phase parts.

Magnitude =

Phase angle =

Then I plotted themA picture containing chart, shape

Description automatically generated

Chart, histogram

Description automatically generatedChart, shape

Description automatically generatedChart, histogram

Description automatically generated

**Problem 4:**

I repeated part 3 using 128 points and plotted the magnitude and the phase angle

Chart, histogram

Description automatically generatedChart, shape, histogram

Description automatically generated

Chart, histogram

Description automatically generatedChart, histogram

Description automatically generated

**Problem 5:**

The frequency spectrum of 256 points compared to that of 128 points is forming a clearer and more accurate graphs as the more points the more accuracy of the signal you get. In other words, there was a small difference between both. As the magnitude of the 256 and the 128 had quite similar graphs. However, the 256 was more specific. Also, the phase angle of the 256 had more points than 128 which had more specific graph.

**Problem 6:**

I applied the inverse DFT on the 256 points that applied DFT so it became the same signal once again. They are identical as the inverse DFT function reverses back the DFT and forms the original signal. Chart, line chart

Description automatically generatedChart, line chart

Description automatically generated

**Problem 7:**

I recorded a 1 second WAV file “eman.wav”

**Problem 8:**

The problem asked to apply the DFT and the inverse DFT on the recorded WAV file “eman.wav”. I used python to implement the code. So, I read the Wave file inside the program and got the sampling rate and the data of the WAF file. I chose a suitable sampling rate and then applied the DFT first and then the inverse DFT and then I wrote the data in the output file called “eman\_rec.wav” . After listening to them they were identical.