**DFT Properties report**

Introduction

Basic theory

Experiments

Exercises from 1 to 6

L = 30 samples

F = 2000 Hz



Shows downsampling. It seems hard to see the actual sine wave. We can check if the signal is compliant with the Nyquist-Shannon Sampling Theorem as:

Regarding the comparation between the built-in Matlab’s fft() function and our custom function, the experimental result with the previous signal shows that they are equivalent. The fast fourier transform is intended to be used in computers has it is more efficient. Even in our simple case, the difference is quite impressive.



A math equation with numbers and symbols

Description automatically generated



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Description automatically generated

Now, we increase the FFT resolution:



Now there is no error. Some error fin frequency that seems to be with approximations from Matlab computing the absolute value of the Fourier coefficients

A number of numbers and symbols

Description automatically generated with medium confidence

For the 9, 10 results. It is contraintuitive:



This seems to be ok, but the ifft shows:



With errors for the reconstructed high fourier resolution signal.

Ex.19:



Here we can check the 10 samples delay applied in frequency was a success. Then the property is demonstrared experimentally.

Results (Comment experiments)