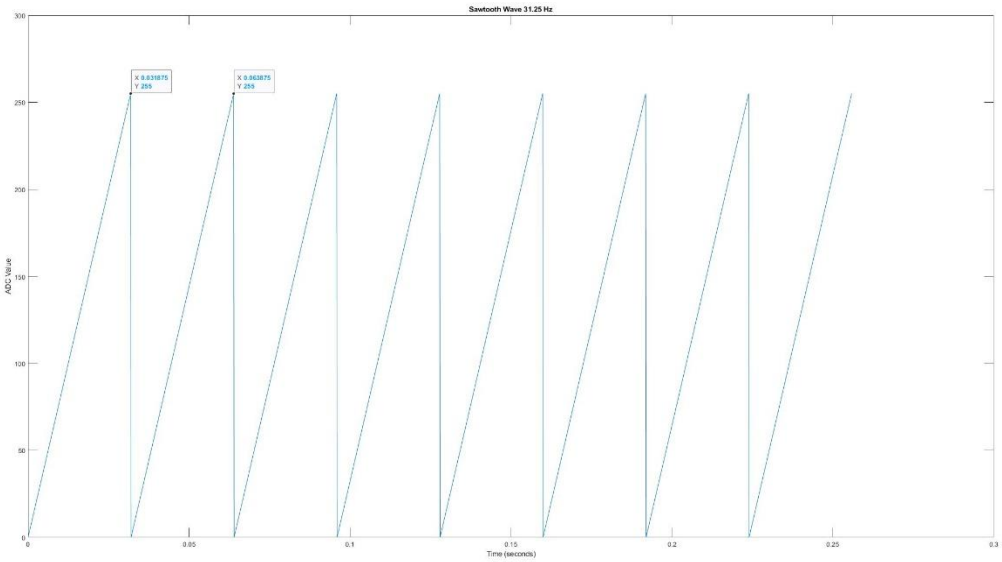
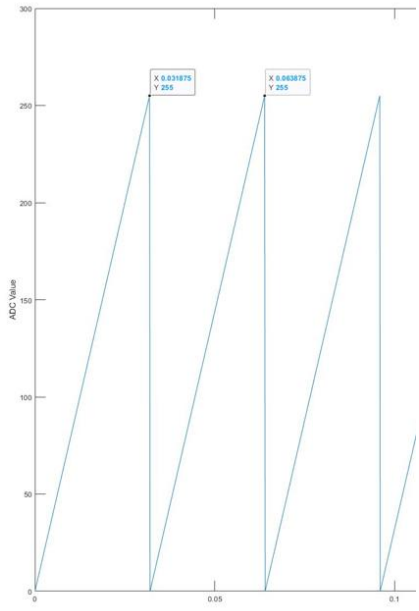
Aly Ghallab

HW 11 Report

CMPEN 472

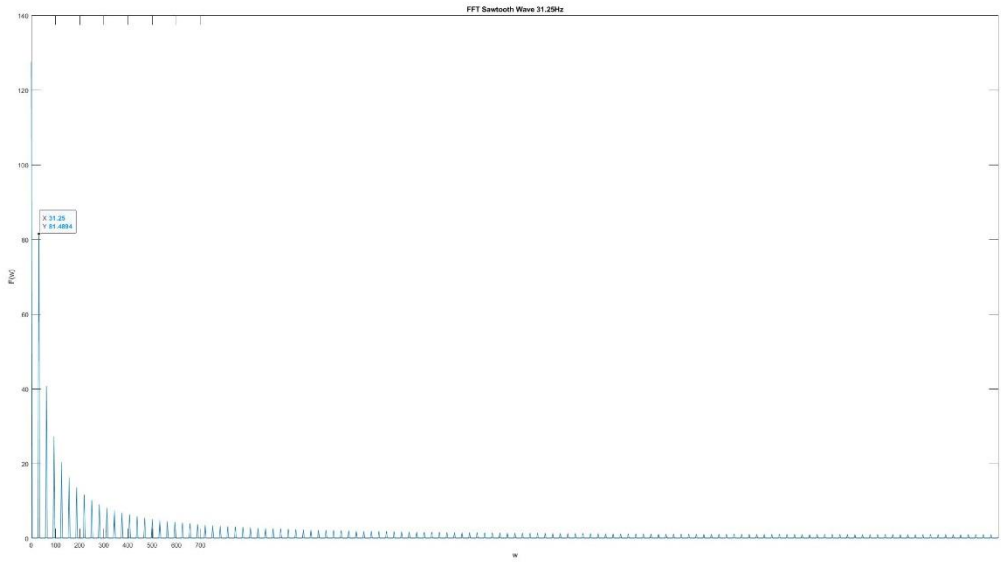
I. Sawtooth Wave



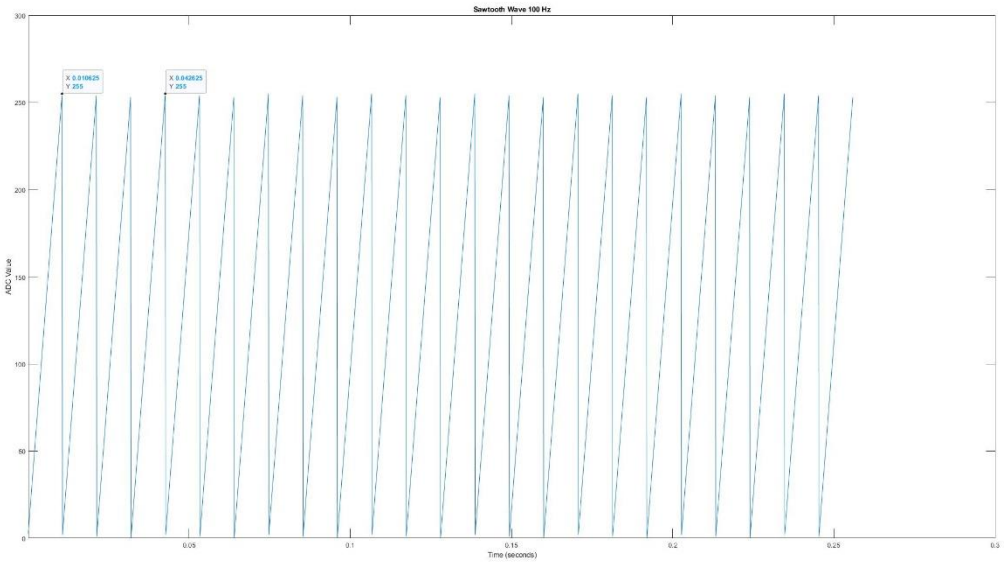

Here is a Sawtooth Wave at the base frequency, as expected it has 8 peaks over the 2048 points. When calculating the period using the two points above we get the frequency to be 31.25 Hz

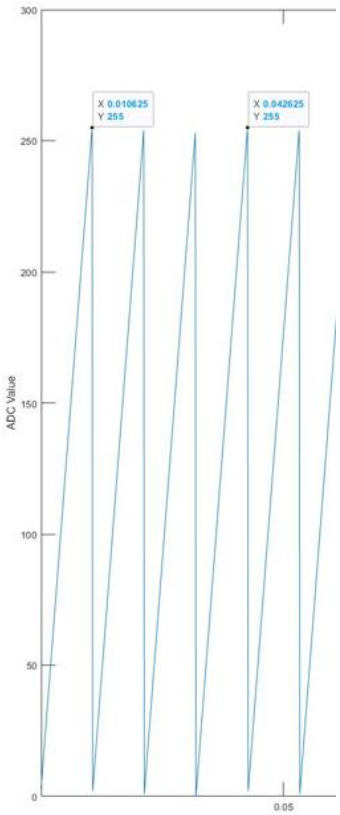
II. Sawtooth Wave 31.25Hz FFT




When Performing the FFT we can see a peak at 31.25Hz, the frequency of the above Sawtooth Wave, with a tight frequency distribution.

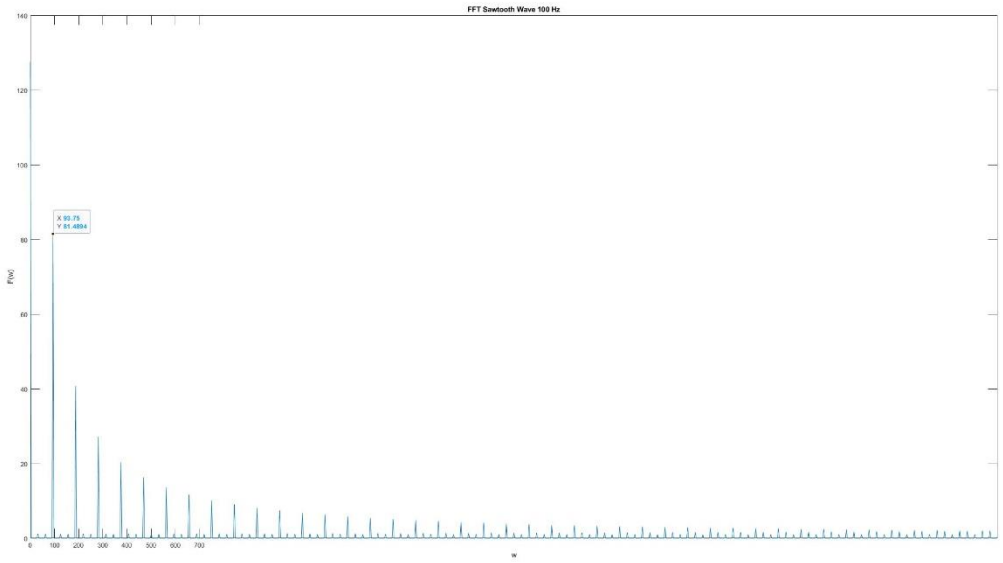
III. Sawtooth Wave 93.75 Hz



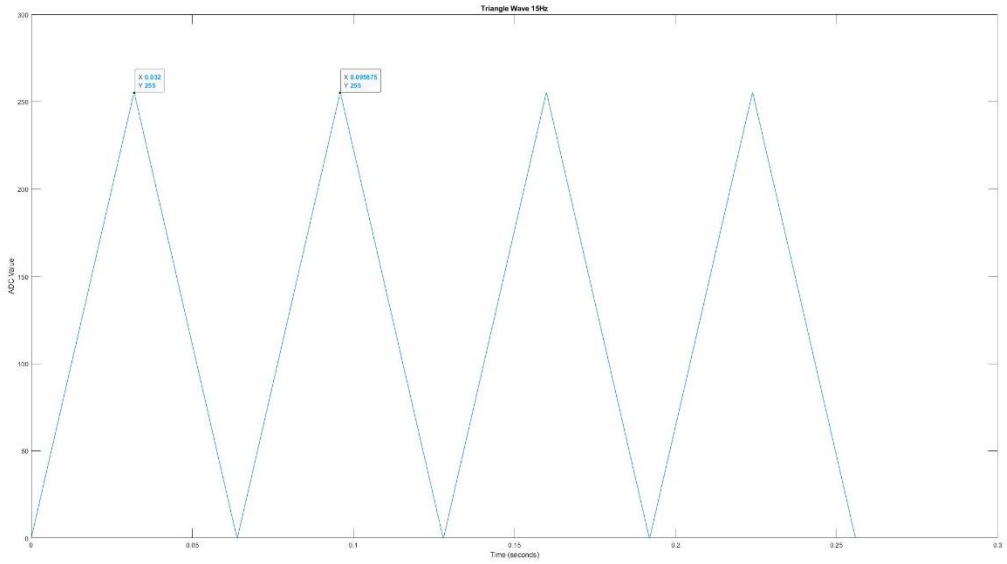

Here we can see triple the peaks in the sawtooth wave as the last one. When calculating the frequency using the two points above accounting for a multiple of the period, we can see that it's 93.75Hz, as expected.

IV. FFT of 93.75Hz Sawtooth Wave



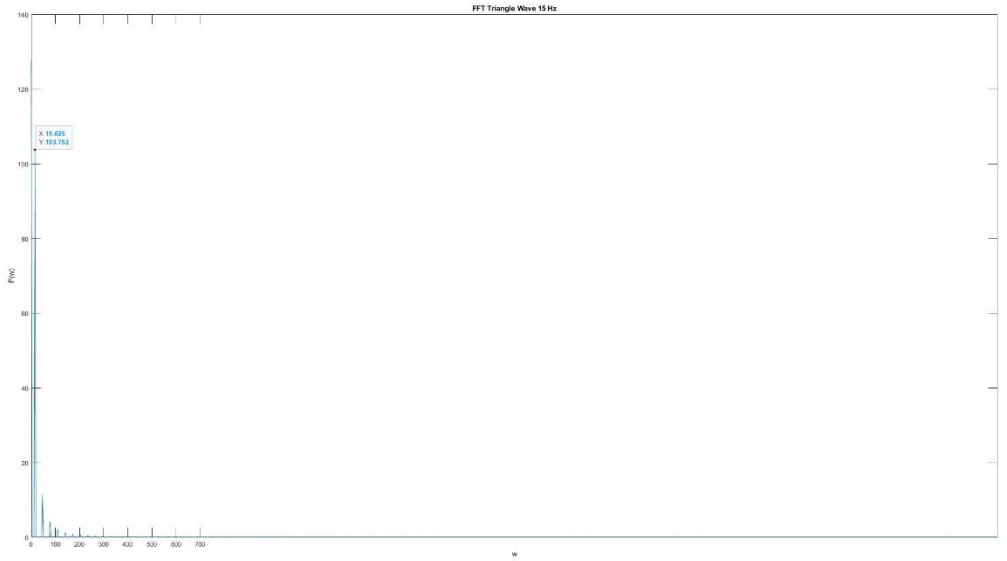

Here, we can see a peak at 93.75 Hz with a relatively tight frequency distribution.

V. Triangle Wave 15Hz



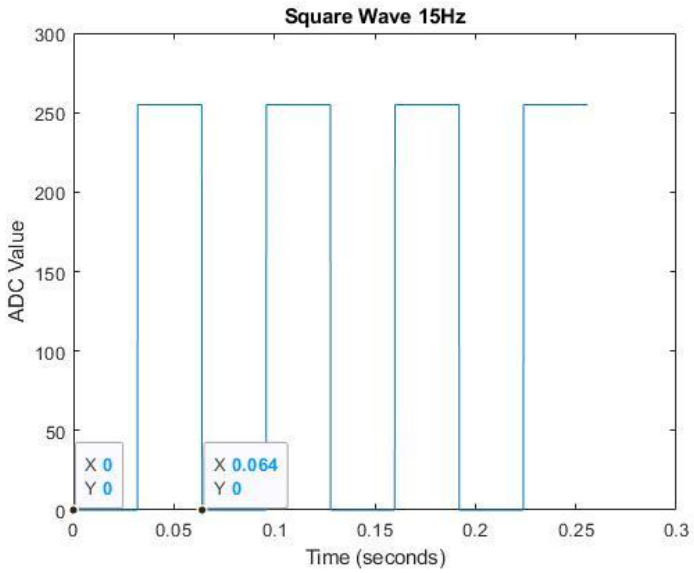

Here we can see that there are 4 peaks as expected over 2048 data points. When calculating the period is 15Hz.

VI. FFT of Triangle Wave 15Hz



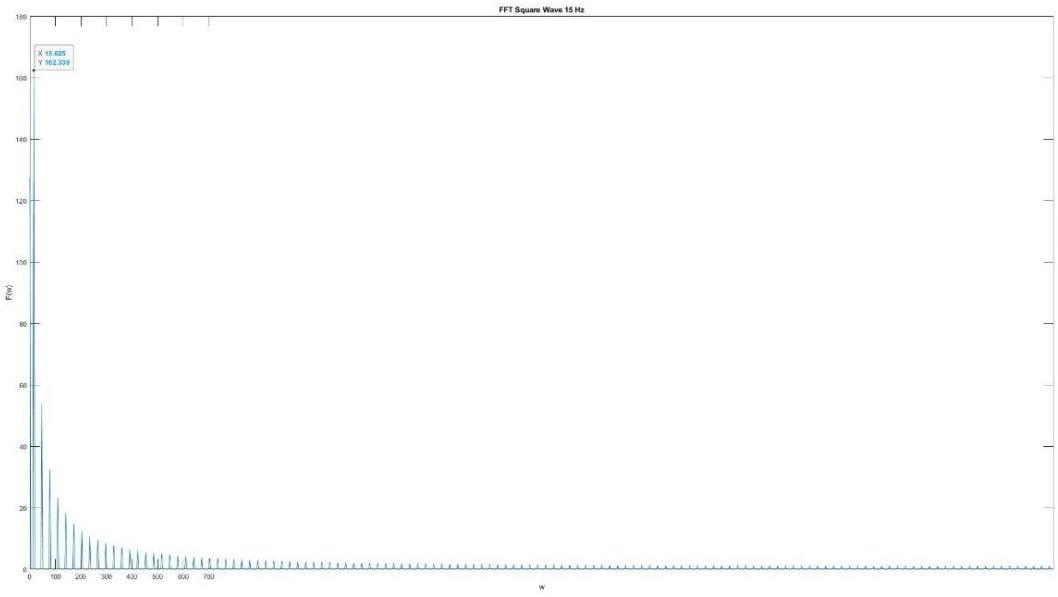

Taking the FFT of the triangle wave we can see a peak at 15Hz and a tight frequency distribution.

VII. Square Wave 15Hz



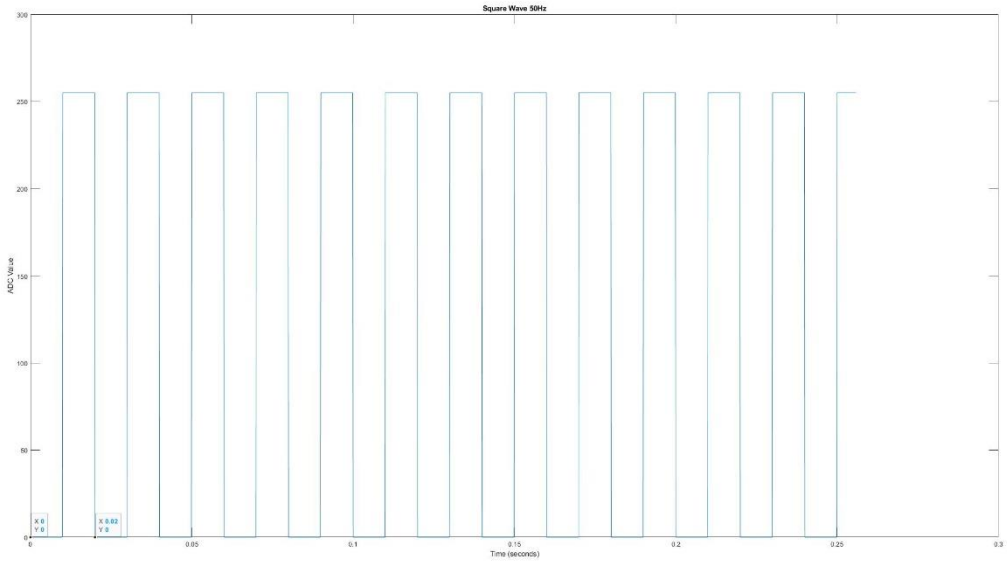

Here we can see the base Square Wave at 15hz with 4 peaks over the 2048 data points. When calculating the period based off the two points we can see the frequency

VIII. Square Wave 15Hz FFT



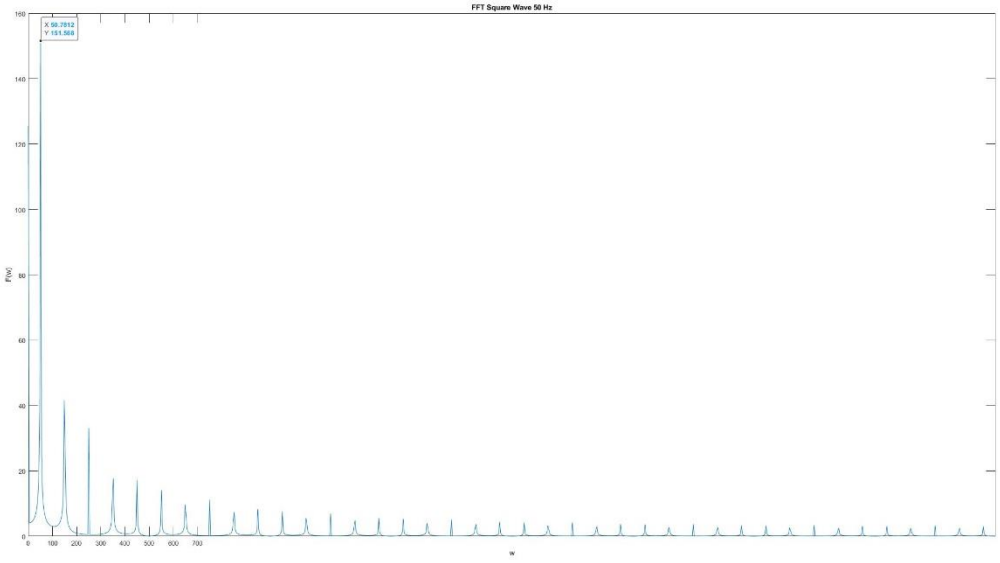

Here we can see a peak at 15 Hz indicative of the Square Wave above, it has a tight frequency distribution because the frequency is kept constant.

IX. Square Wave 50Hz



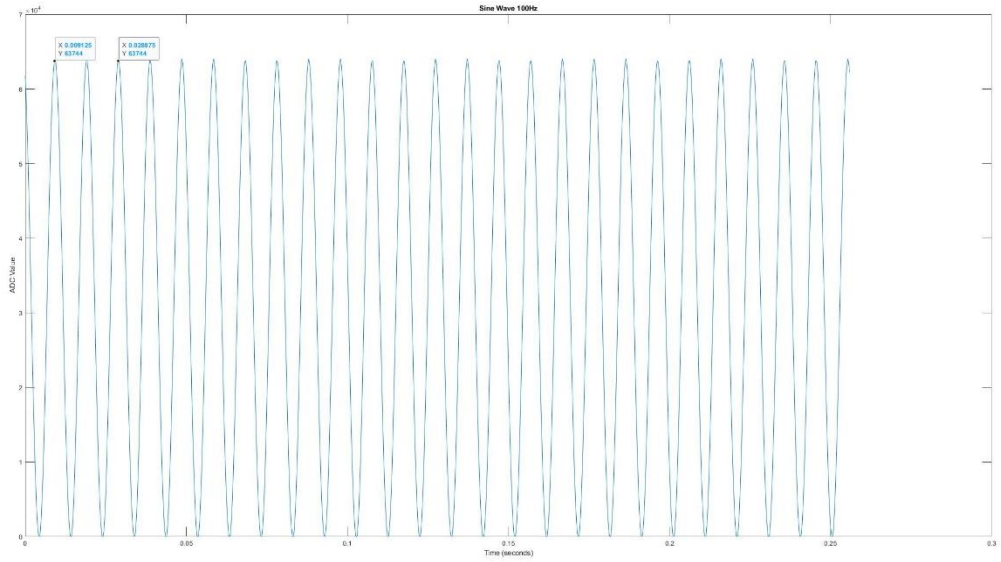

After tripling the frequency of the above square wave we can see triple the number of peaks over 2048 points, we can also see that the frequency tripled to be about 50Hz.

X. FFT of 50Hz Square Wave



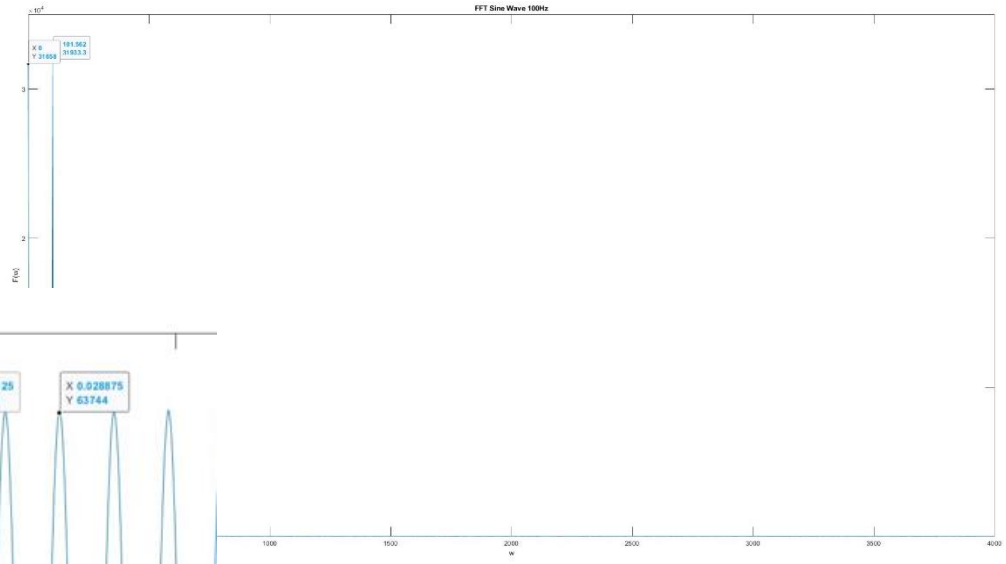

Doing the FFT of the Wave above we can clearly see that the peak is at 50Hz matching the frequency of the above wave as expected.

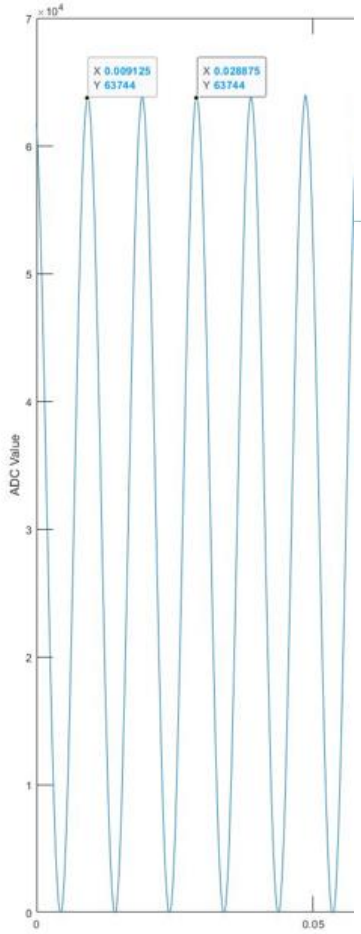
XI. 100Hz Sine Wave



When using ADC to get the sine wave we can take two points and calculate the frequency to be about 100Hz.

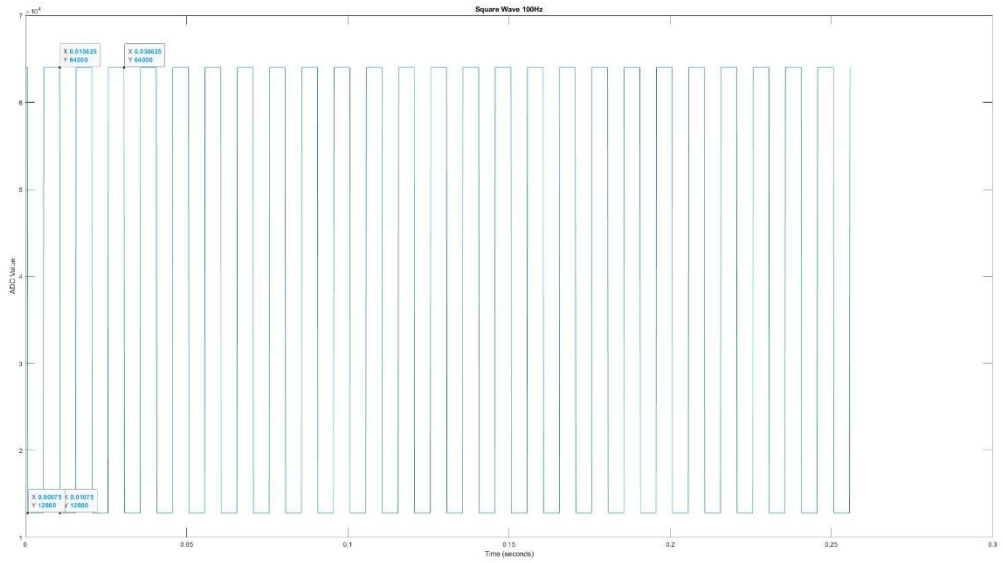
## XII. FFT of 100Hz Sine Wave

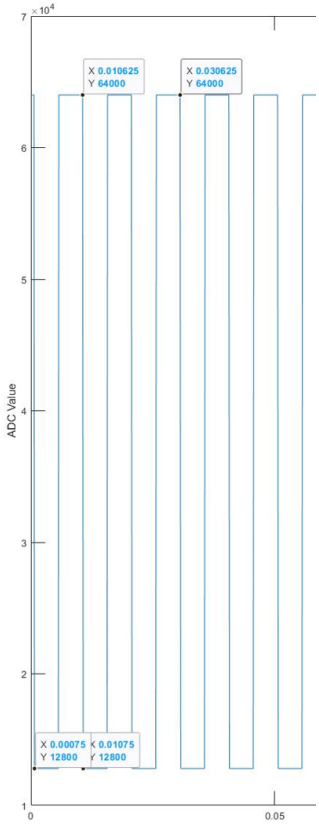



After taking the FFT of the above wave we can see a distinct peak at 101 Hz further validating the accuracy of the code and methods used.

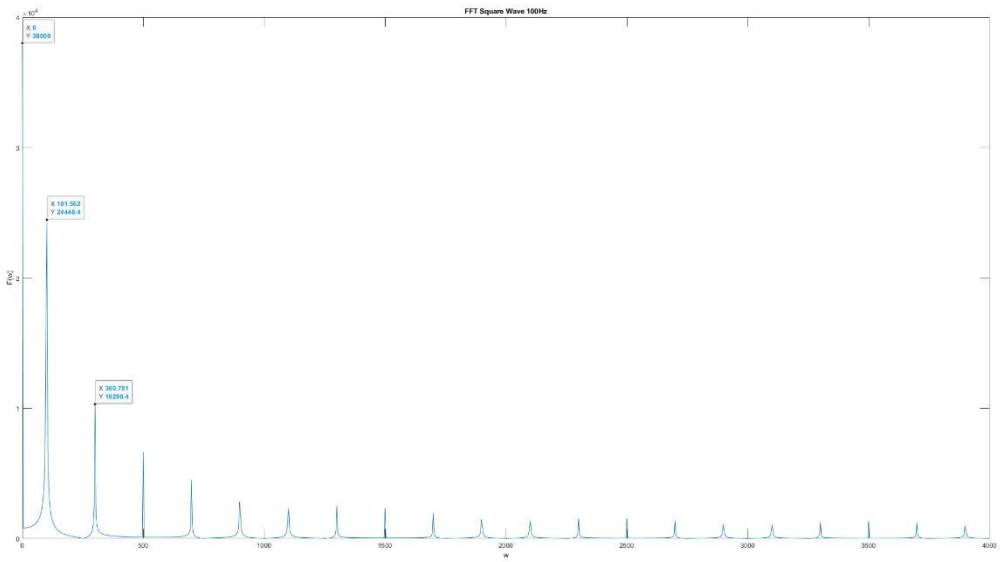
XIII. Square Wave 100Hz



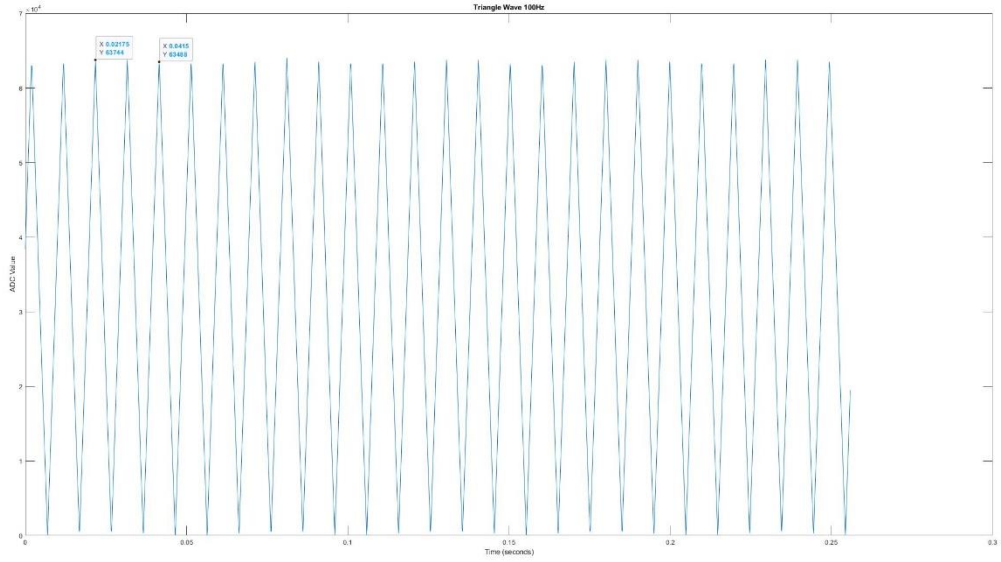

Upon taking two points and calculating the frequency we can see that the frequency of the square waves is also 100 Hz over the 2048 points of data, which is the expected result.

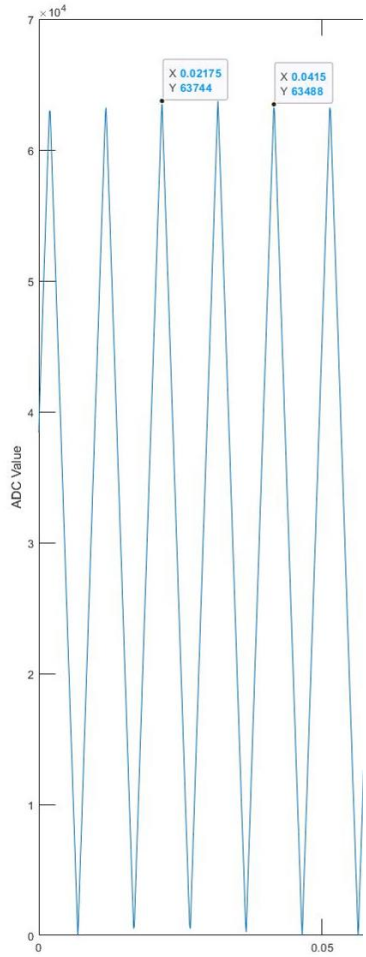
XIV. FFT of 100Hz Square Wave




Here we can see the peak at 101Hz as expected. The other peaks are because of the fact that a square wave is not a pure sinusoidal wave, just a composition of them.

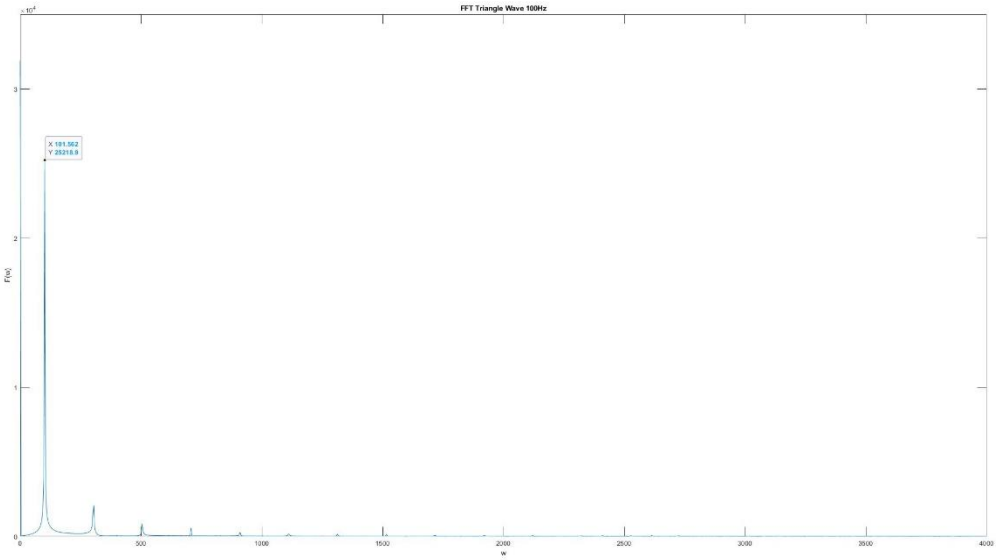
XV. Triangle Wave 100Hz





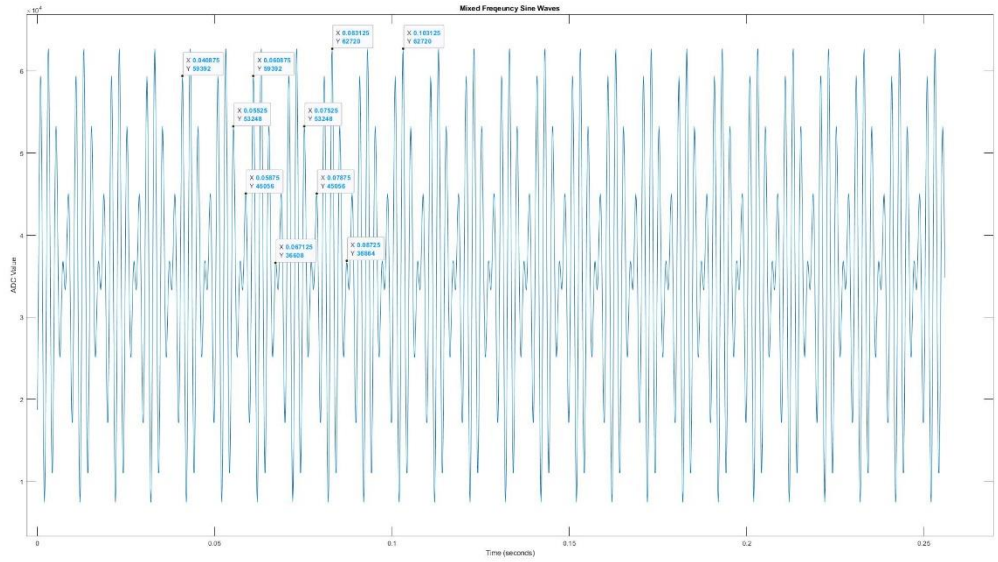

Here upon taking two points to find the period then frequency we can also validate that the frequency of the wave is about 100Hz over the 2048 data points.

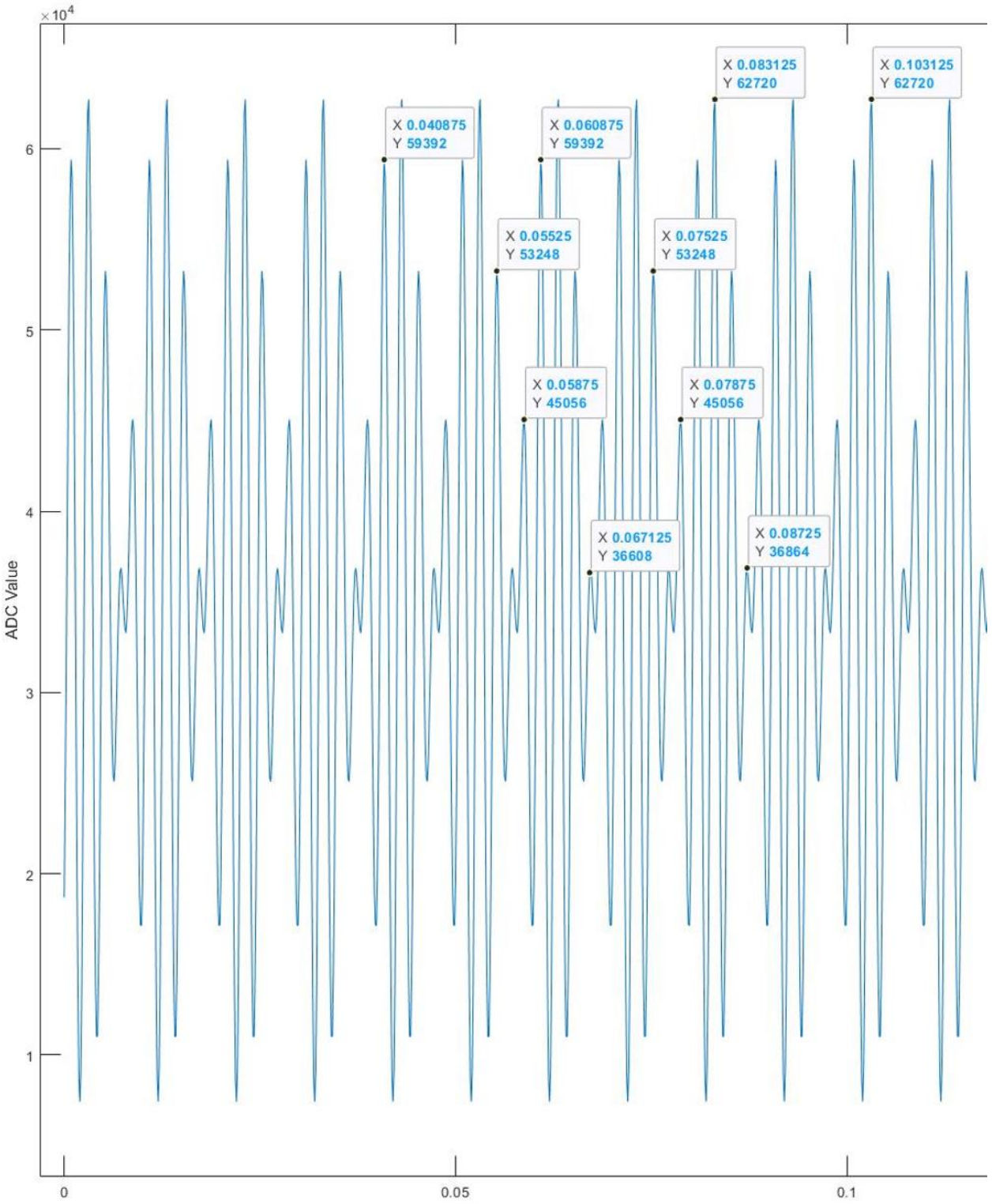
XVI. FFT of Triangle Wave 100Hz




Taking the FFT of the above wave we can see that theres a distinct peak at 101Hz suggesting that the code and methods used was correct.

XVII. Mixed Frequency Sine Waves

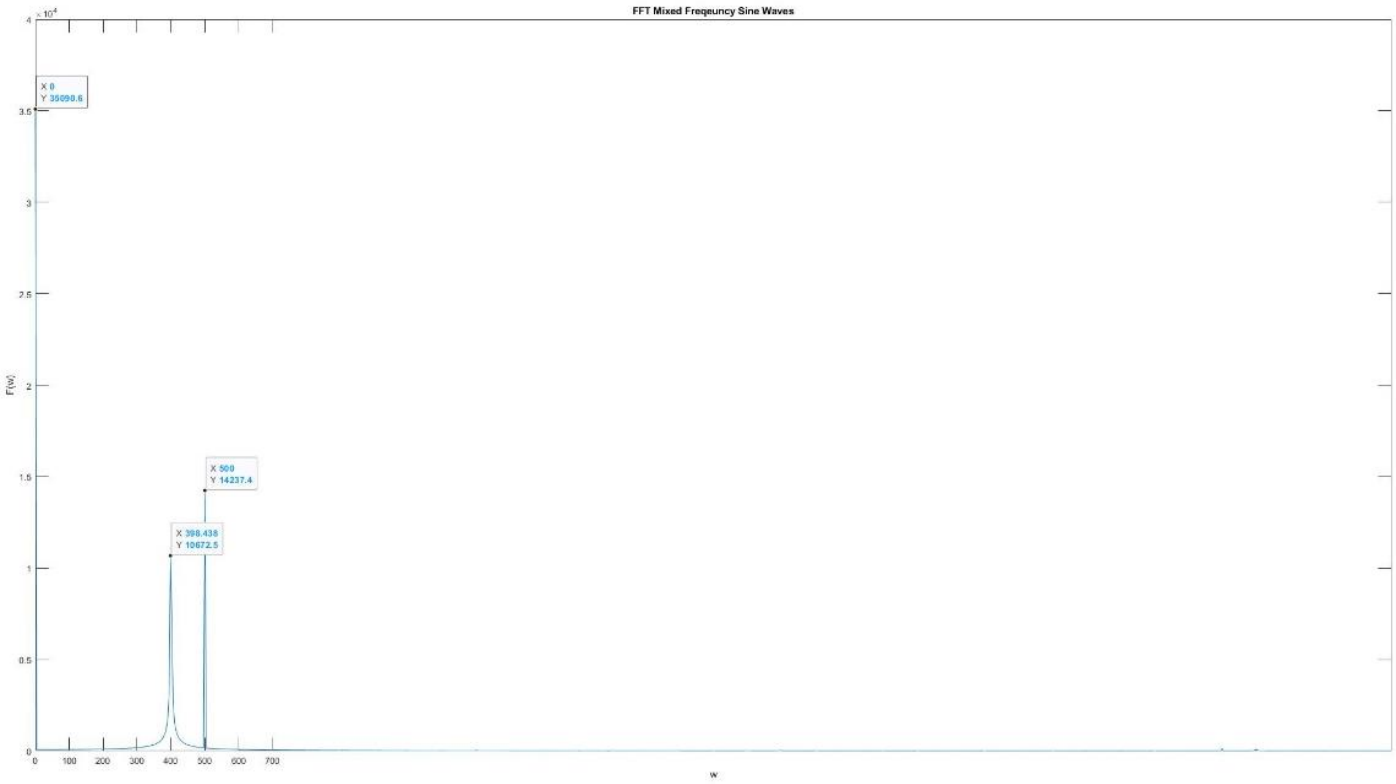





Here are the mixed frequency sine waves superimposed on the same plot. We can see multiple of these waves and could calculate the periods and frequencies using the points above, however I opted to just use the FFT below.

XVIII.

XIX. FFT of Mixed Frequency Sine Waves




Upon taking the FFT of the Sine Waves we can determine their frequencies to be 398 Hz (approx. 400Hz) and 500 Hz.