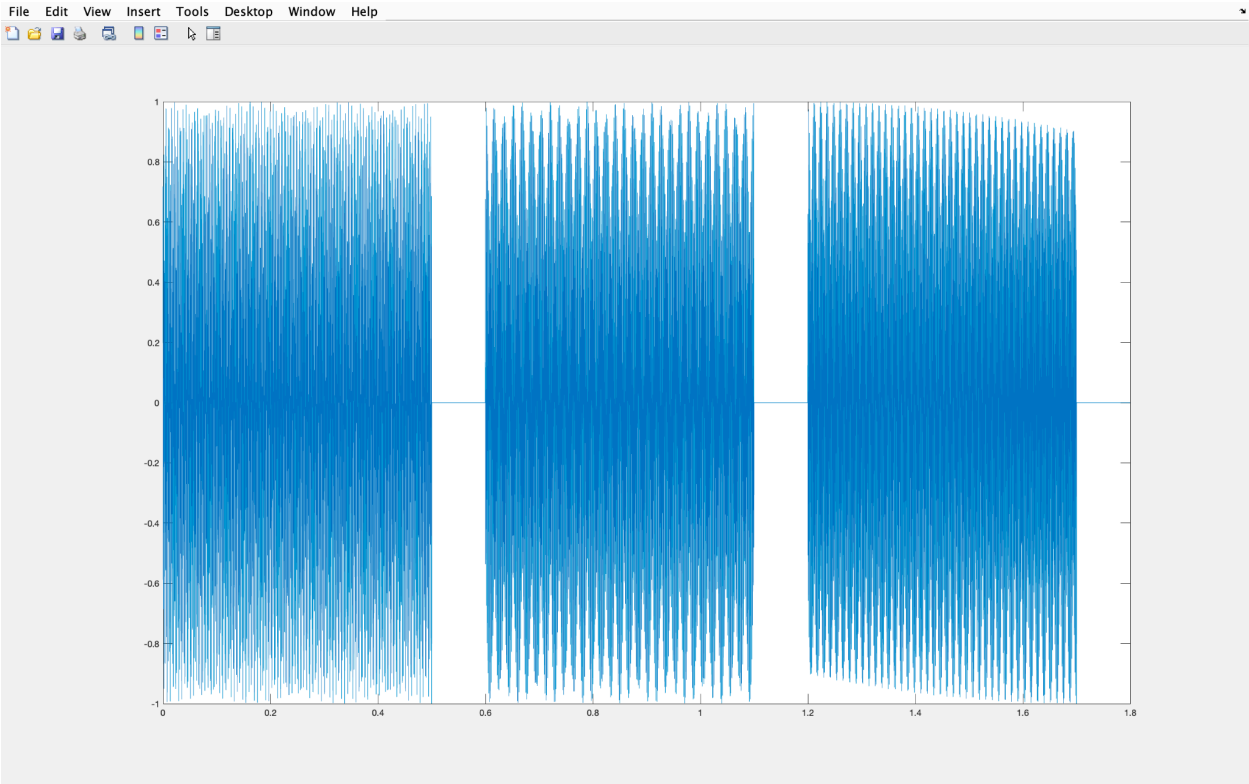
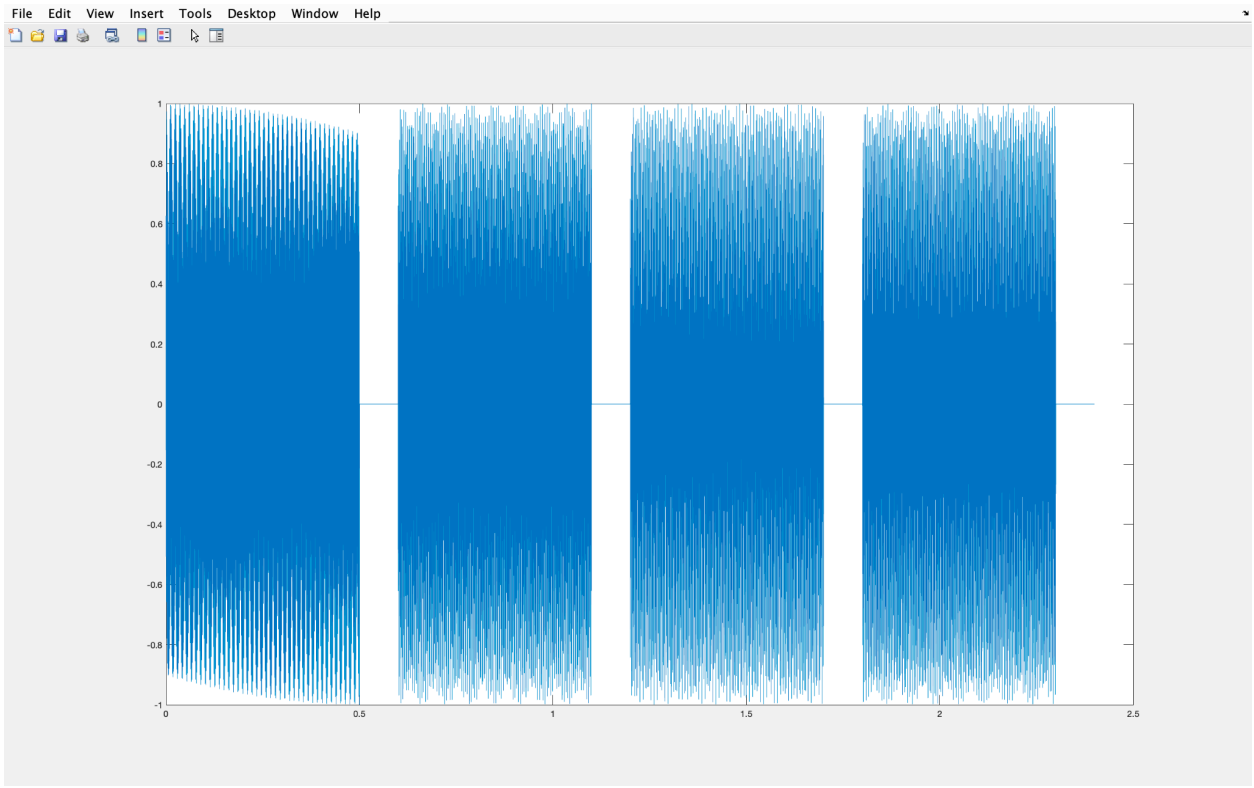
ECEN 133: Lab 3
Aidan O'Hare and Jack Landers

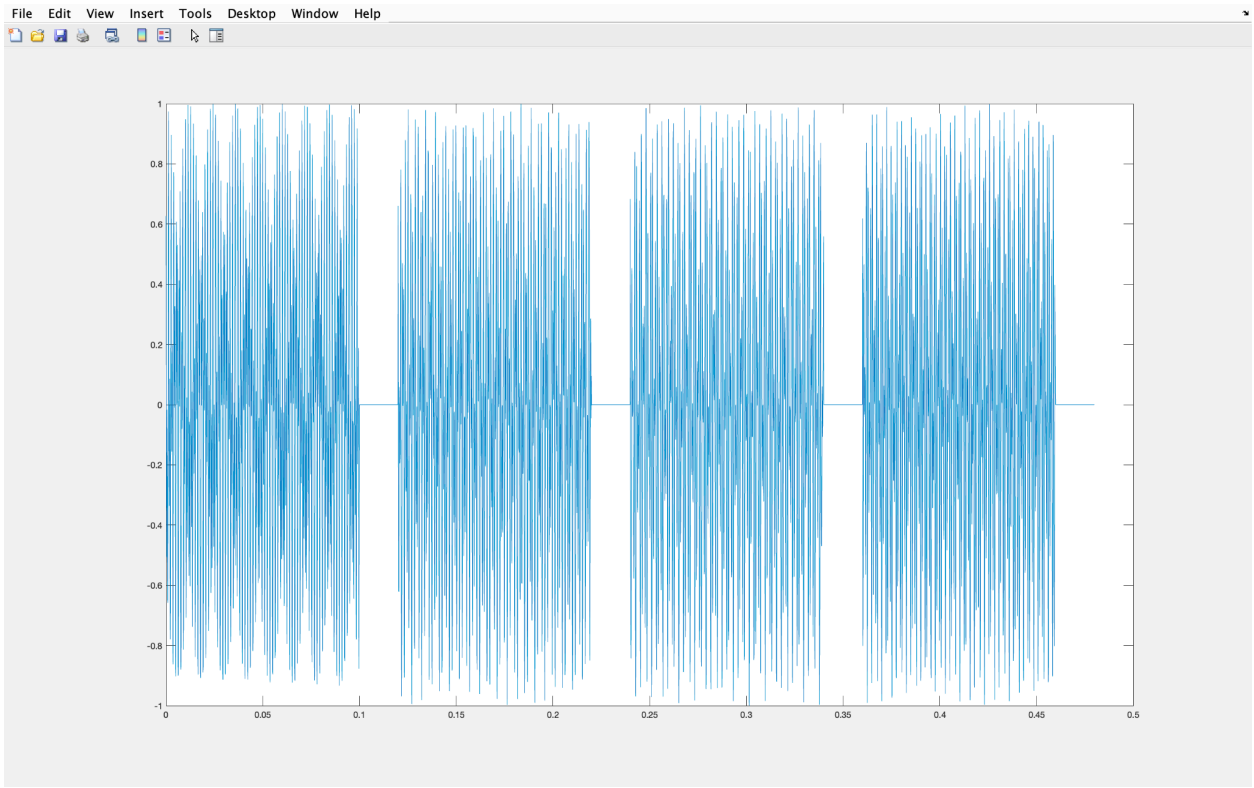
Step 1



Step 2

The sound of each tone is faster. Because the frequencies are the same, the tones sound the same.


File Edit View Insert Tools Desktop Window Help
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.5
1
1.5
2
2.5


File Edit View Insert Tools Desktop Window Help
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0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5

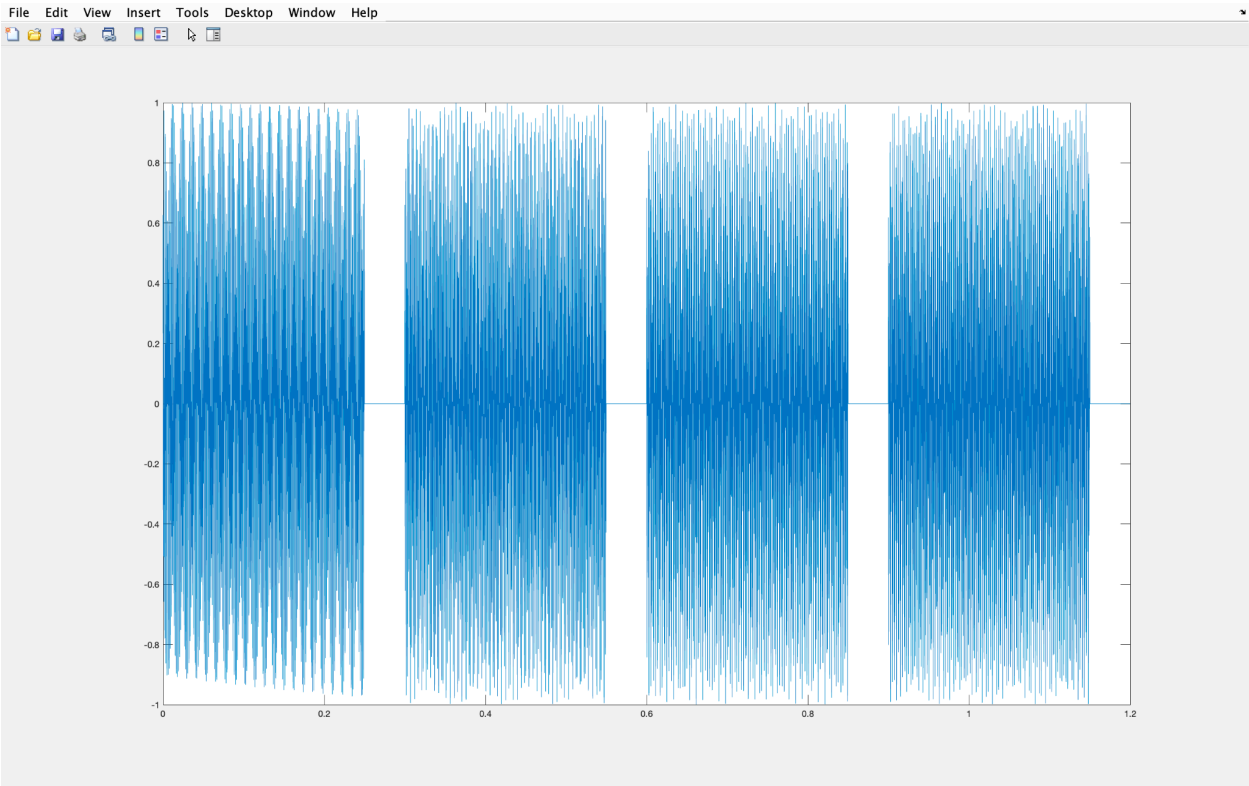
Step 3

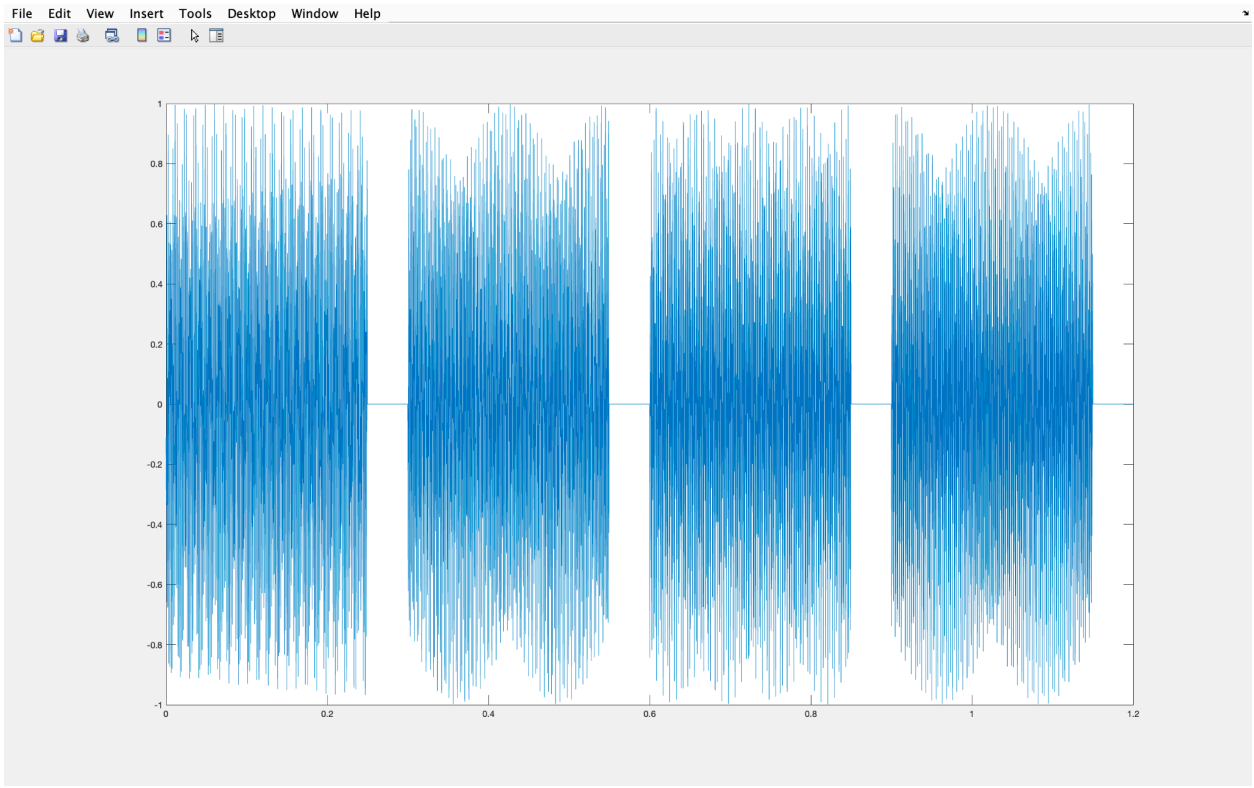
Total time duration = 1.2s

The change in sampling frequency to 16000Hz did not affect the sound or the duration of the signal.

The change in sampling frequency to 4000Hz changed the graphs where the signal did not reach max amplitude as often, but did not affect the or the duration of the signal.

The change in sampling frequency to 2000Hz changed the graphs and decreased the tones to a lower pitch, but the duration of the signal is still the same.




File Edit View Insert Tools Desktop Window Help
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0.6
0.4
0.2
0
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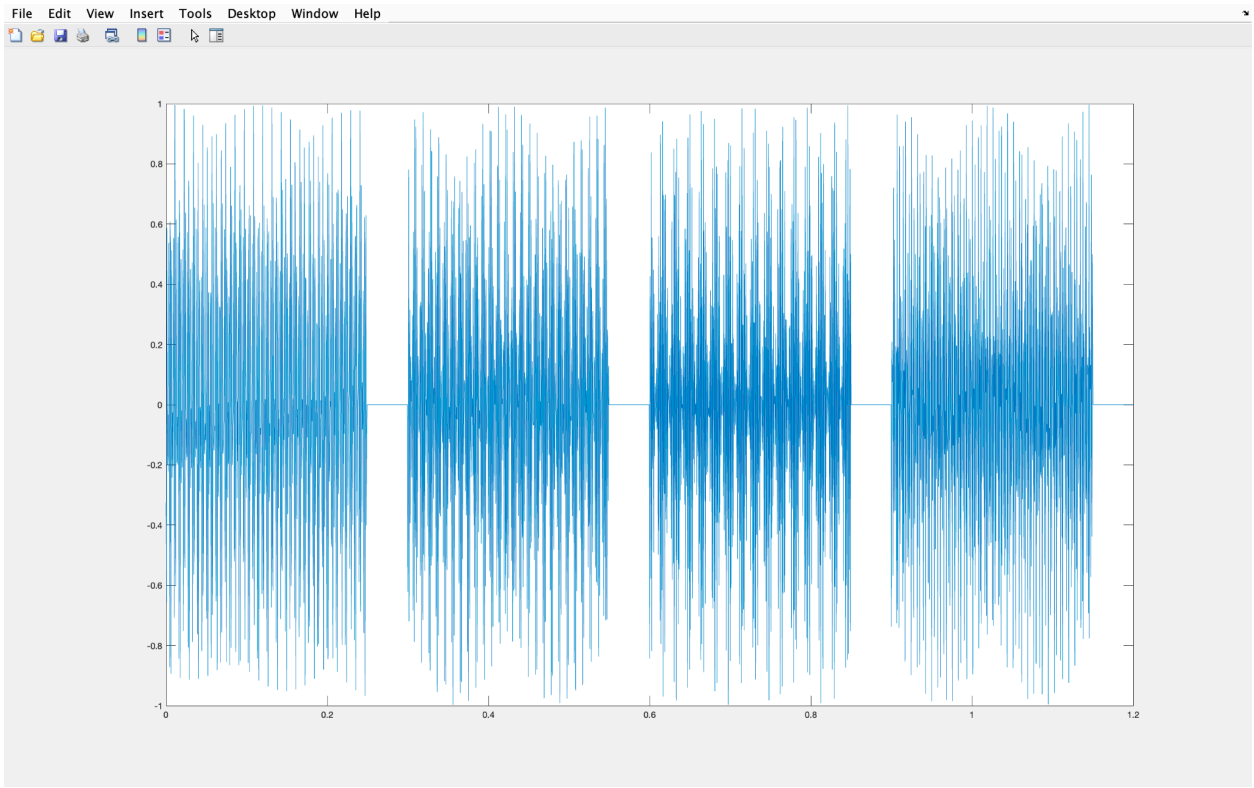
-0.4
-0.6
-0.8
-1
0
0.2
0.4
0.6
0.8
1
1.2


File Edit View Insert Tools Desktop Window Help
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0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.2
0.4
0.6
0.8
1
1.2

Step 4

The filter should apply a moving average to the previous 6 values of the frequencies which will delay the signal and make it smoother.

w = 697 Hz: 0.61
w = 770 Hz: 0.54
w = 852Hz: 0.46
w = 941Hz: 0.367
w = 1209 Hz: 0.104
w = 1336 Hz: 0.005
w = 1477 Hz: 0.1

It is a low pass filter so the column dials will be filtered out, because they are high frequencies.

The plot is consistent with our predictions. The high pitch tones are quieter to hear and the low pitch tones are louder

w = 697 Hz: 0.041
w = 770 Hz: 0.13
w = 852Hz: 0.19
w = 941Hz: 0.22
w = 1209 Hz: 0.009
w = 1336 Hz: 0.011
w = 1477 Hz: 0.095

The filter is acting as a band pass filter for the frequencies between the range 850 to 1000 Hz.

This is consistent with the plot where the 3 passed tones are louder than the rest and the 1209 Hz tone is especially muted.

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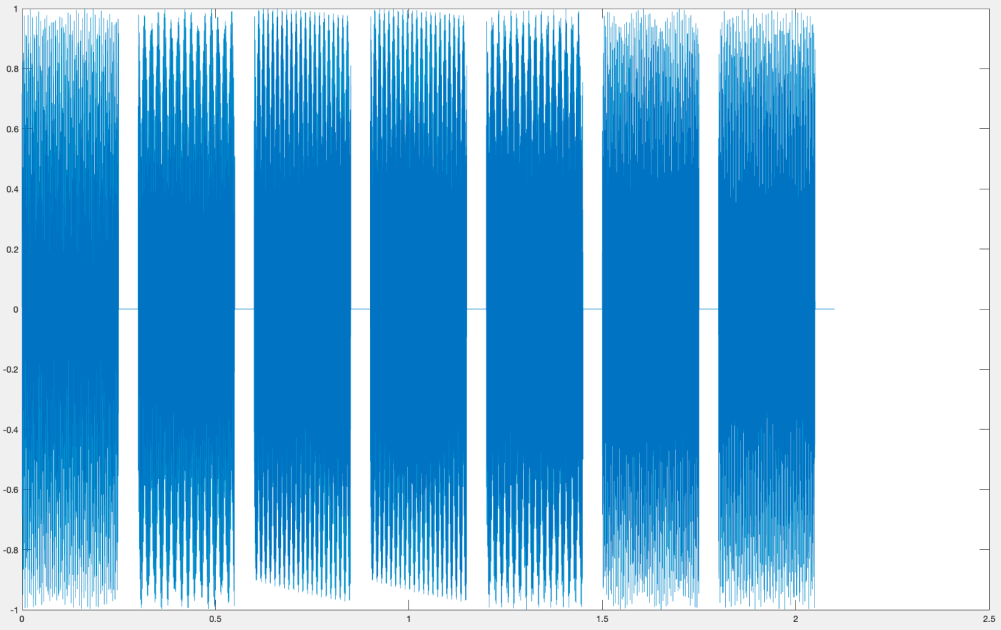

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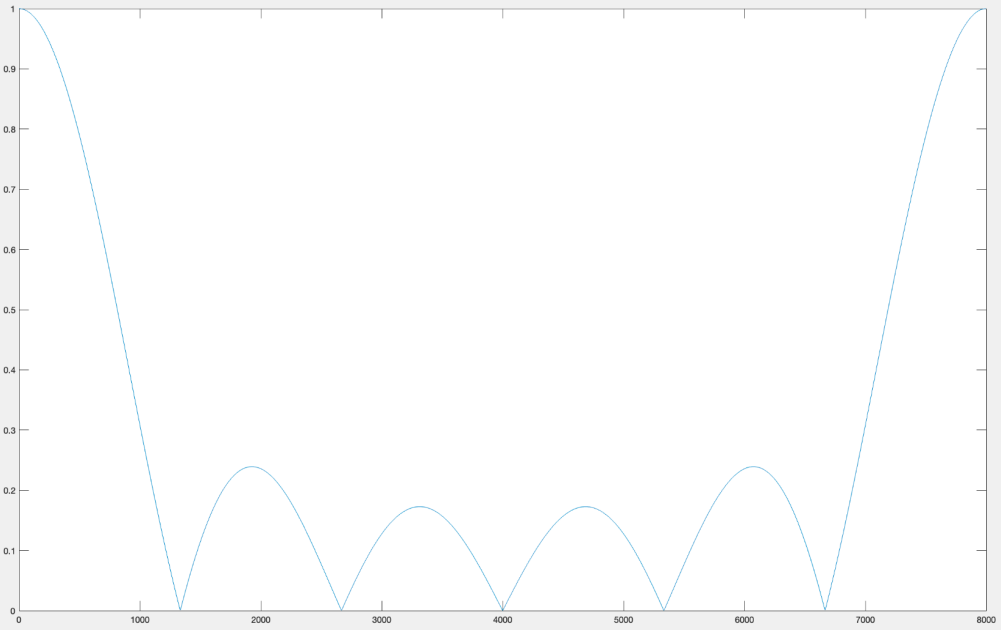

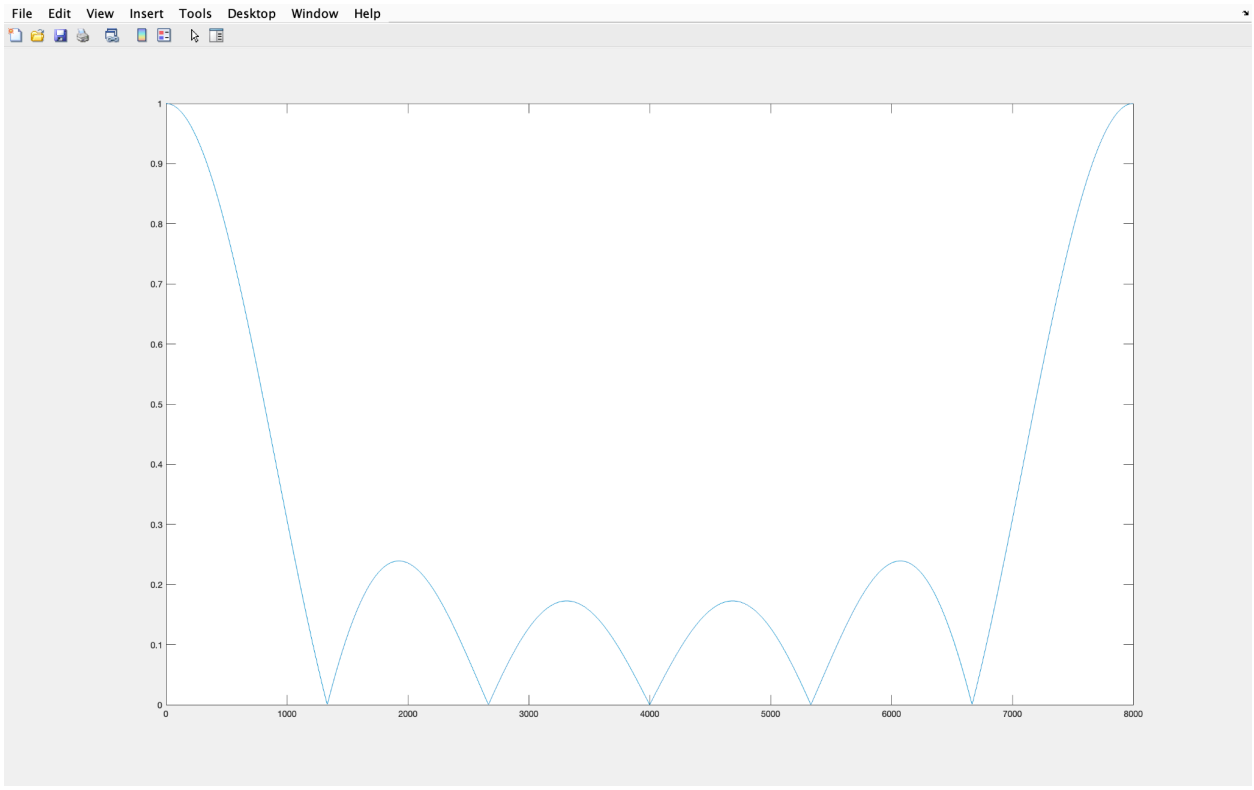
File Edit View Insert Tools Desktop Window Help
1
0.9
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0.7
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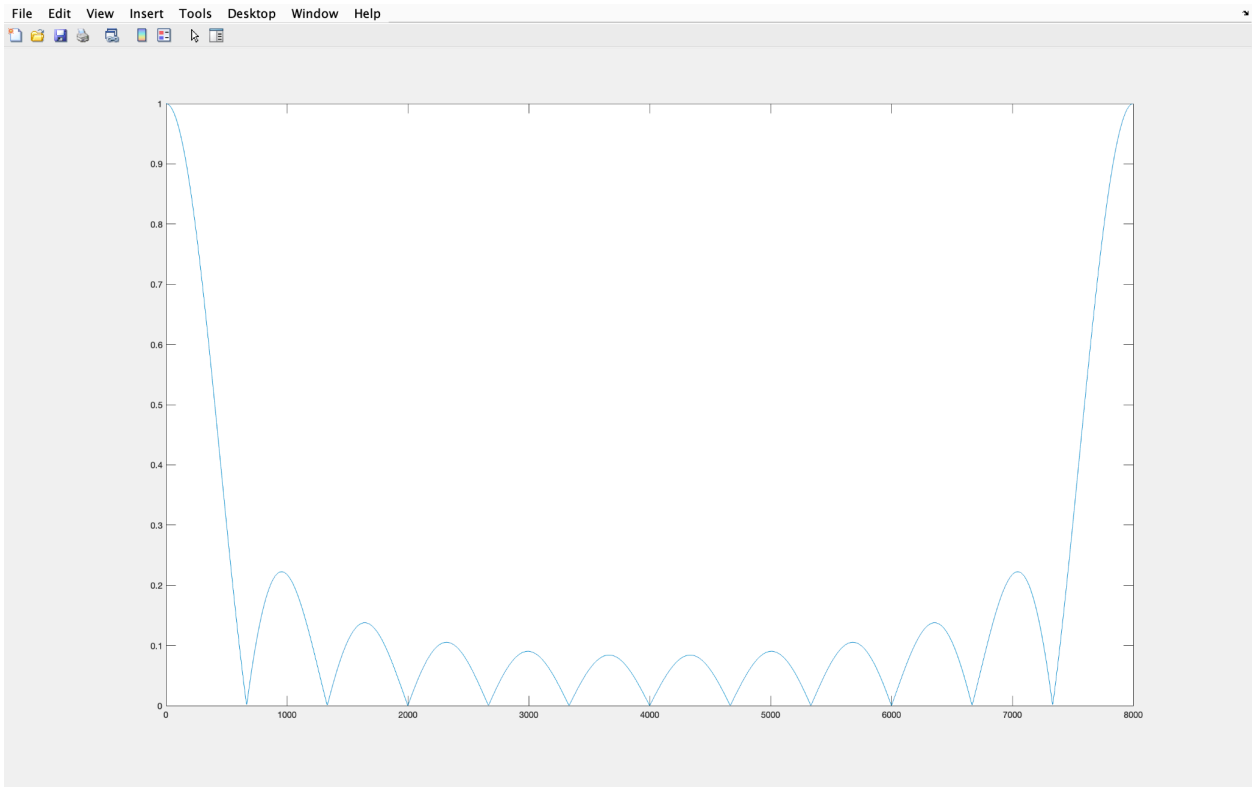
0.3
0.2
0.1
0
0
1000
2000
3000
4000
5000
6000
7000
8000


File Edit View Insert Tools Desktop Window Help
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0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1000
2000
3000
4000
5000
6000
7000
8000