## Physics of Music - Activity \#3

## Strings, Waves and other Things!

1. Set up your monochord and adjust it to your liking. Carefully measure the length of the string (from bridge to nut) and measure the frequency of the fundamental and the first 3 overtones. Do this by capturing the waveform and constructing a FFT. (Use the "Snipping tool" to provide a screen-capture for both the waveform and the FFT). Prepare a table similar to the following and include your screen captures with this (8 marks):

| Harmonic \# | F = frequency (Hz) | Length (m) |
| :---: | :--- | :--- |
| 1 |  |  |
| 2 |  | String density $=$ |
| 3 |  | $5.5 \times 10^{-4} \mathrm{~kg} / \mathrm{m}$ |
| 4 |  |  |

2. From the information collected in \#1 determine the wave speed and tension for the wave on the string (4 marks)
3. Experiment with different bridges. They range from the good, the bad to the plain UGLY! Can you hear any difference when using different bridges? Use 3 different bridges and supply FFT graphs for each. Comment on whether or not you can hear differences in the sound or see differences in the FFTs. Be sure to indicate which FFT goes with which bridge. (6 marks)
4. Suppose you want to tune your string to a pitch of $C 3(130.8 \mathrm{~Hz})$. How would adjust the length to accomplish this? How would you change the tension to do this? . ( 5 marks)
5. If your string resonated at 132 Hz how many cents sharp are you relative to C3? Show this by carrying out the calculation. How many cents sharp with the first overtone be relative to C4? (4 marks)
6. Suppose you were able to tune the fundamental of your string to play C3 when it was 65 cm from bridge to nut. Indicate where you would place frets to play (3 marks):
a. a fifth higher than C3
b. a fourth higher than C3
c. the octave (C4)
