Math 3450 **Written HW #5**
Winter 2021 **February 19**

This assignment is due at 11:59pm on Friday, February 26^{th}. *Detail all work* for complete credit. Students may work together on this project, but each student must individually write up their own codes and solution set.

1. **(50 points)** Find a large set of real-world, periodic or nearly periodic data (other than tidal data).
   (a) Get your data set approved by Dr. Carter.
   (b) Completely explain the data and include a plot/plots of it.
   (c) Take an FFT of the data and include a plot of the magnitudes of the Fourier coefficients.
   (d) What are the frequencies of the dominant components? What does this tell you about the physical system? Explain in detail.
   (e) How many Fourier modes are necessary to accurately recreate the original data? What does this tell you about the physical system?

Bonus (3 points) The person with the most "interesting" data set (according to Dr. Carter's taste) will get three bonus points.

Bonus (2 points) Use FFTs/Fourier theory to explain how a trumpet's middle C sounds differently from a saxophone's middle C.