HW5 Physics 321 Fall 2019

1. For the function $f(t) = \begin{cases} \sin(\omega_0 t) & |t| < \frac{N\pi}{\omega_0} \\ 0 & |t| > \frac{N\pi}{\omega_0} \end{cases}$ with N being an arbitrary integer.

a. Plot the function

b. Justify using symmetry that you only need a sine fourier transform to fully characterize this function.

c. Using the sine fourier transformation, find $F(\omega_0)$

d. Plot the result.

2. For the function $f(x) = \begin{cases} \mathrm{h}(1 - \mathrm{a}|x|) & |x| < \frac{1}{a} \\ 0 & |x| > \frac{1}{a} \end{cases}$

a. Plot the function

b. Find the Fourier transformation

c. Plot the result

3. Repeat #2 using the discrete fourier transform in Octave, first without padding and then with padding. Provide ".m" files that are fully commented as well as any plots or other work.