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AMATH 585 WINTER 2022 HW 6

Problem 1

Any function with chebyshev coefficients $a_0, a_1, \cdots, a_n$, evaluated at the chbyshev node is given as:

$$p(\cos(k\pi/n)) = \sum_{j=0}^{n} a_j \cos(jk\pi/n) \tag{1}$$

Our objective here is make use hf the FFT algorithm for DFT for the objective of: Interpolation the function at chebyshev node getting the values of $a_0, a_1, \cdots, a_n$, and evaluating the function value at the chebyshev nodes using the FFT algorithm.

My claim here is that, if we tiled the vector in the following format: $[a_0, a_1, \cdots, a_{n-1}, a_n, a_{n-1}, \cdots, a_1]$, so that it's symmetric exclusing the first element, and then we put this into the DFT algorithm using FFT, then we obtain the following relationsship: