Lab 5

1. Calculate the Fourier matrix for n = 4 in Python using the fast Fourier transform.
2. Calculate the discrete Fourier transform of the vector (0, 1, 2).
3. Find the cyclic convolution of the vectors a = (0, 1, 2) and b = (3, 1, 2) in Python using the fast Fourier transform. Compare with the results calculated by hand in Lab 4.
4. Find the cyclic convolution of the vectors x = (0, 1, 0, 1) and y = (0, 1, 2, 3) in Python using the fast Fourier transform. Compare with the results calculated by hand in Lab 4.
5. Calculate the matrix product using the fast Fourier transform of the following two circulant matrix:

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \\ 2 & 3 & 1 \end{bmatrix} \quad \text{and} \quad D = \begin{bmatrix} 5 & 0 & 4 \\ 4 & 5 & 0 \\ 0 & 4 & 5 \end{bmatrix}$$