

## Linear Algebra & Fourier Analysis

## Assignment 02

September 13, 2024

Total - 50 Marks, Due date: Thursday, September 19 (You need to answer all questions)

1. Try to compute eigenvalue and eigenvectors for the following matrix:

$$\begin{pmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 2 \end{pmatrix}$$

(5 Marks)

2. Find a matrix P such that the following matrix A can be diagonalized:

$$A = \begin{pmatrix} 1 & 1 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

(5 Marks)

3. Consider the following function:

$$f(x) = \begin{cases} -x, & -\pi < x < 0\\ x, & 0 < x < \pi \end{cases}$$

Decide whether the function is odd or even, and find its Fourier expansion. (5 Marks)

4. Calculate the Fourier Sine series of the function

$$f(x) = \cos x, 0 \le x \le \pi$$

Hint: Generate an odd extension of the given function on the interval  $-\pi \le x \le \pi$ . If you don't remember the definition of odd extension then here it is,

$$f_{\text{odd}}(x) = \begin{cases} f(x), 0 < x < L \\ -f(-x), -L < x < 0 \end{cases}$$

(5 Marks)

## Best of Luck!