

CSE 220: Online B1-B2

Fourier Transform

Time: 30 minutes

Problem Description

You are given an image of a function, which is defined as a piecewise function over the interval $[-3, 3]$. From -3 to -1 and 1 to 3 , those are parabola.

Your task is to implement the function, perform the Fourier Transform, and prove Parseval's theorem. For integral you can only use `trapz`. Use FT and IFT code from your offline.

Theory

Parseval's Theorem

Parseval's theorem states that the total energy of a signal in the time domain is equal to the total energy in the frequency domain. Mathematically, for a function $f(t)$ and its Fourier transform $\mathcal{F}(f)$, Parseval's theorem is given by:

$$\int_{-\infty}^{\infty} |f(t)|^2 dt = \int_{-\infty}^{\infty} |\mathcal{F}(f)|^2 df$$

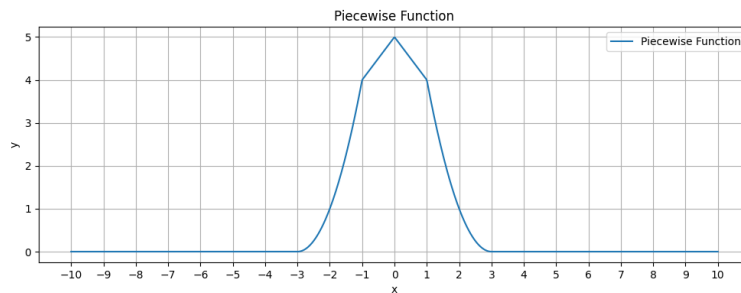


Figure 1: Input Function

Submission Instructions

- Submit the python file named as 2105XXX.py