CAS 741: Problem Statement
A Fourier Series Library

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1 Goal

I intend to implement a library for Fourier series related computation. I will mainly implement the following functions.

- Compute the Fourier series of a given function.

- Compute the value of a function with given variable value and the Fourier series of a function.

- Implement the addition, subtraction, multiplication and division of Fourier series.

- Implement some basic functions (sin, exp, etc.) of Fourier series.

- Formatted input and output of Fourier series.

The aforementioned function shall be a $\mathbb{R} \to \mathbb{R}$ function, whose Fourier series exists. Instead of verification by this library (due to foreseeable technical difficulties), this property shall be guaranteed by the users.

2 Motivation

An equation solver, whose development I currently participate in, utilizes Taylor Series, and I intend to see if its Taylor Series parts can be replaced by Fourier series ones. For this purpose, I need to implement a basic library for the Fourier series related computations, hence this library.

3 Environment

This library is developed and tested on the 64-bit Ubuntu 18.04, and might be tested on the macOS 10.14 and 10.15 (after its release).

This library's compatibility with other environments are not guaranteed nor tested, although I guess that it should be compatible with 64-bit Ubuntu 16.04.