CHAPTER OVERVIEW

10: Fourier Series and Fourier Transforms

The **Fourier transform** is one of the most important mathematical tools used for analyzing functions. Given an arbitrary function $f(x)$, with a real domain ($x \in \mathbb{R}$), we can express it as a linear combination of complex waves. The coefficients of the linear combination form a complex counterpart function, $F(k)$, defined in a wave-number domain ($k \in \mathbb{R}$). It turns out that F is often much easier to deal with than f; in particular, differential equations for f can often be reduced to algebraic equations for F, which are much easier to solve.

10.1: Fourier Series

10.2: Fourier Transforms

10.3: Fourier Transforms for Time-Domain Functions

10.4: Basic Properties of the Fourier Transform

10.5: Fourier Transforms of Differential Equations

10.6: Common Fourier Transforms

10.7: The Delta Function

10.8: Multi-Dimensional Fourier Transforms

10.9: Exercises

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