Review of Fourier Transform

Here, we briefly review some properties of the Fourier transform. For a deterministic function $x(t)$ the Fourier transform (if exists) is defined as

$$\mathcal{F}\{x(t)\} = \int_{-\infty}^{\infty} x(t)e^{-2\pi ift}\ dt,$$

where $i = \sqrt{-1}$. The Fourier transform of $x(t)$ is a function of f, so we can show it by $X(f) = \mathcal{F}\{x(t)\}$. We can obtain $x(t)$ from its fourier transform $X(f)$ using

$$x(t) = \mathcal{F}^{-1}\{X(f)\} = \int_{-\infty}^{\infty} X(f)e^{2\pi ift}\ df.$$

In general $X(f)$ is a complex-valued function, i.e., we can write $X(f) : \mathbb{R} \mapsto \mathbb{C}$.

Fourier Transform

Fourier transform

$$X(f) = \mathcal{F}\{x(t)\} = \int_{-\infty}^{\infty} x(t)e^{-i2\pi ft}dt$$

Inversion formula

$$x(t) = \mathcal{F}^{-1}\{X(f)\} = \int_{-\infty}^{\infty} X(f)e^{i2\pi ft}df$$

When working with Fourier transform, it is often useful to use tables. There are two tables given on this page. One gives the Fourier transform for some important functions and the other provides general properties of the Fourier transform. Using these tables, we can find the Fourier transform for many other functions.