Ex03

ゆきちゃん

2019 年 4 月 16 日

- Given a rectangular pulse sugnal $x(t)$ defined by

$$x(t) = \begin{cases} 1, & |t| < \alpha \\ 0, & |t| > \alpha \end{cases} \tag{0-1}$$

1. Find the Fourier transform $X(\omega)$ of $x(t)$

Answer:

$$\begin{aligned} X(\omega) &= \mathcal{F}[x(t)] & \text{(0-2)} \\ &= \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt & \text{(0-3)} \\ &= \int_{-a}^{a} e^{-j\omega t} dt & \text{(0-4)} \end{aligned}$$

$\omega = 0$ の時

$$\begin{aligned} X(\omega) &= \int_{-a}^{a} dt & \text{(0-5)} \\ &= 2a & \text{(0-6)} \end{aligned}$$

$\omega \neq 0$ の時

$$\begin{aligned} X(\omega) &= \left[\frac{1}{-j\omega} e^{-j\omega t} \right]_{-a}^{a} & \text{(0-7)} \\ &= \frac{1}{-j\omega} \left(e^{-j\omega a} - e^{j\omega a} \right) & \text{(0-8)} \\ &= \frac{2}{\omega} \sin(\omega a) & \text{(0-9)} \\ &= 2a \mathrm{sinc}(\omega a) & \text{(0-10)} \end{aligned}$$