

応数Ⅰ（フーリエ） 課題 9

H30 年度 番号 4J42

フーリエ変換

例題 10-16, 10-17 を確認し, 章末問題の[演習 7]を行う.

[演習 7]

1)

$$f(t) * f(t) \leftrightarrow F(\omega) \cdot F(\omega)$$

2)

$$\frac{1}{2\pi} \delta(t) \leftrightarrow \frac{1}{2\pi}$$

3)

$$\begin{aligned} 2 &\leftrightarrow 2 \cdot 2\pi\delta(\omega) \\ &= 4\pi\delta(\omega) \end{aligned}$$

4)

$$\delta(t - 5) \leftrightarrow e^{-j5\omega}$$

5)

$$\begin{aligned} &2\pi e^{j4t} \\ &= 2\pi \cdot 1 \cdot e^{j4t} \leftrightarrow 2\pi \cdot \delta(\omega - 4) \\ &= 4\pi^2 \delta(\omega - 4) \end{aligned}$$

6)

$$\begin{aligned} &\delta(\omega - 2) \\ \frac{1}{2\pi} e^{j2t} &\leftrightarrow \frac{1}{2\pi} \cdot 2\pi\delta(\omega - 2) \end{aligned}$$

7)

$$\delta(t) + e^{j2t} \leftrightarrow 1 + 2\pi\delta(\omega - 2)$$

8)

$$g(t) = \begin{cases} 1 & (|t| \leq \frac{1}{2}) \\ 0 & (|t| > \frac{1}{2}) \end{cases}$$

$$g(t) \leftrightarrow \text{sinc}\left(\frac{\omega}{2}\right)$$

$$\begin{aligned} g(t) * g(t) &\leftrightarrow \text{sinc}\left(\frac{\omega}{2}\right) \cdot \text{sinc}\left(\frac{\omega}{2}\right) \\ &= \text{sinc}^2\left(\frac{\omega}{2}\right) \end{aligned}$$

9)

$$f(t) = g(t) \cdot \cos \omega_0 t, g(t) = \begin{cases} 1 & (|t| \leq \frac{1}{2}) \\ 0 & (|t| > \frac{1}{2}) \end{cases}, \omega_0 = 4\pi$$

$$g(t) \cdot \cos \omega_0 t \leftrightarrow \frac{1}{2} \{G(\omega + \omega_0) + G(\omega - \omega_0)\}$$

$$G(\omega) = \text{sinc}\left(\frac{\omega}{2}\right) \text{ となり}$$

$$\begin{aligned} g(t) \cdot \cos \omega_0 t &\leftrightarrow \frac{1}{2} \left\{ \text{sinc}\left(\frac{\omega + \omega_0}{2}\right) + G\left(\frac{\omega - \omega_0}{2}\right) \right\} \\ &= \frac{1}{2} \left\{ \text{sinc}\left(\frac{\omega + 4\pi}{2}\right) + \text{sinc}\left(\frac{\omega - 4\pi}{2}\right) \right\} \end{aligned}$$