■□■ 離散フーリエ変換と離散フーリエ積分のまとめ ■□■

離散フーリエ変換	離散フーリエ積分
$X_k = \frac{T_0}{N}\sum_{n=0}^{N-1} x_n {W_N}^{nk}$ $(k = 0, 1, 2, \cdots, N-1)$	$x_n = \frac{1}{T_0}\sum_{k=0}^{N-1} X_k {W'_N}^{nk}$ $(n = 0, 1, 2, \cdots, N-1)$
$x_n = x(n\Delta t)$	$X_k = X(k\Delta f)$
$W_N = e^{-i\frac{2\pi}{N}}$	$W'_N = e^{i\frac{2\pi}{N}}$
$\Delta f = \frac{f_s}{N} = \frac{1}{T_0}$	$\Delta t = \frac{T_0}{N} = \frac{1}{f_s}$
$f_s = N\Delta f = \frac{1}{\Delta t}$	$T_0 = N\Delta t = \frac{1}{\Delta f}$

周波数領域では、以下の関係が成り立つ。

$$\{\ X(0),\ X(\Delta f),\ X(2\Delta f),\ X(3\Delta f),\ \cdots,\ X((N/2)\Delta f),\ X((N/2+1)\Delta f),\ \cdots,\ X((N-2)\Delta f),\ X((N-1)\Delta f)\ \}$$

$$= \{\ X(0),\ X(\Delta f),\ X(2\Delta f),\ X(3\Delta f),\ \cdots,\ X((N/2)\Delta f),\ X((-N/2+1)\Delta f),\ \cdots,\ X(-2\Delta f),\ X(-\Delta f)\ \}$$

$N = 4$ の場合：

$$\{\ X(0),\ X(\Delta f),\ X(2\Delta f),\ X(3\Delta f)\ \}$$

$$= \{\ X(0),\ X(\Delta f),\ X(2\Delta f),\ X(-\Delta f)\ \}$$

$N = 8$ の場合：

$$\{\ X(0),\ X(\Delta f),\ X(2\Delta f),\ X(3\Delta f),\ X(4\Delta f),\ X(5\Delta f),\ X(6\Delta f),\ X(7\Delta f)\ \}$$

$$= \{\ X(0),\ X(\Delta f),\ X(2\Delta f),\ X(3\Delta f),\ X(4\Delta f),\ X(-3\Delta f),\ X(-2\Delta f),\ X(-\Delta f)\ \}$$