

DTFT

$$X(\omega) = \sum_{n=-\infty}^{\infty} x(n) e^{-j\omega n}$$

IDTFT

$$x(n) = \frac{1}{2\pi} \int_{-\pi}^{\pi} X(\omega) e^{+j\omega n} d\omega$$

DFT

Consider a discrete time input signal $x(n)$ of length N . The DFT of $x(n)$ is denoted by $X(k)$ and is given by

$$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j\frac{2\pi kn}{N}} \rightarrow (1)$$

$$k = 0, 1, 2, \dots, N-1$$

Since the input signal $x(n)$ is of length N , the summation varies from 0 to $N-1$ and eqn (1) is called as N -point DFT

IDFT

We can obtain $x(n)$ from $X(k)$ using the inverse Discrete Fourier Transform IDFT which is given by the formula,

$$x(n) = \frac{1}{N} \sum_{k=0}^{N-1} X(k) e^{+j\frac{2\pi kn}{N}} \rightarrow (2)$$

$$n = 0, 1, 2, \dots, N-1$$

Eqn (2) is called as N -point IDFT