1. Define DFT

Definition:
The **Discrete Fourier Transform (DFT)** converts a discrete-time signal from the **time domain** into the **frequency domain**.
It represents the signal as a sum of sinusoids (complex exponentials) of different frequencies.

In short:
DFT analyzes the frequency content of discrete-time signals.

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2. Write the equation of DFT

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

where:

- $x(n)$ → input sequence
- $X(k)$ → DFT of the sequence
- N → number of points in the DFT

3. Write the equation of Linearity Property of DFT

Linearity Property:

If

$$x_1(n) \xleftrightarrow{\text{DFT}} X_1(k)$$

$$x_2(n) \xleftrightarrow{\text{DFT}} X_2(k)$$

$$ax_1(n) + bx_2(n) \xleftrightarrow{\text{DFT}} aX_1(k) + bX_2(k)$$