

$$x[n] = \delta[n]$$

$$X(k) = \sum_{n=0}^{N-1} x[n] w_N^{kn} \quad \begin{matrix} k=0 \\ \vdots \\ N-1 \end{matrix}$$

$$x[n=1, n=0]$$

$$X(k) = 1 \cdot w_N^{k(0)}$$

$$X(k) = 1$$



You



● REC

$$X(k) = \sum_{n=0}^{N-1} 1 \cdot W_N^{kn} \quad \begin{matrix} kn \\ k=0 \text{ to } N-1 \end{matrix}$$

$$u(n) = 1, \dots \\ = 0 \text{ otherwise}$$

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

Case 2: $k \neq 0$

Case 1: $k=0$

$$X(k) = \sum_{n=0}^{N-1} 1$$

$$X(k) = N$$



You



● REC

$$X(k) = \sum_{n=0}^{N-1} a \cdot w_N^{kn}; k=0 \text{ to } N-1$$

$$= \sum_{n=0}^{N-1} (a \cdot w_N^k)^n$$

$$= \frac{1 - (a \cdot w_N^k)^N}{1 - (a \cdot w_N^k)}$$

$$1 - (a \cdot w_N^k)$$

$$w_N^{kN} = e^{j \frac{2\pi}{N} kN}$$

$$w_N^{kN} = 1$$

$$\sum_{n=0}^{N-1} a^n = \frac{1 - a^N}{1 - a}$$

$$X(k) = \frac{1 - a^N}{1 - a \cdot e^{j \frac{2\pi}{N} kN}} \quad k=0 \text{ to } N-1$$



You

