

$$\frac{1}{K} \sum_{n=0}^{K-1} X[n] e^{j n \frac{2\pi}{K} k} = \mathcal{F}_{n < K}^{-1} \{X[n]\} [k] = \mathcal{F}^{-1} \{X\} [k] = x[k].$$