

$$X(n, \omega) = \sum_{m=-\infty}^{\infty} w[n-m] x[m] e^{-j\omega m}$$

$$X[n, k] = X[n, \omega] \Big|_{\omega = \frac{2\pi nk}{N} = \omega_k} = \sum_{m=-\infty}^{\infty} w[n-m] x[m] e^{-j\omega_k m}$$

$$\boxed{\omega_k = \frac{2\pi k}{N} = \omega_k}$$

INTRO TO THE

SHORT-TIME

FOURIER TRANSFORM

(STFT)

[OS4P 10.3, SORT OF]

DFT

DFT

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

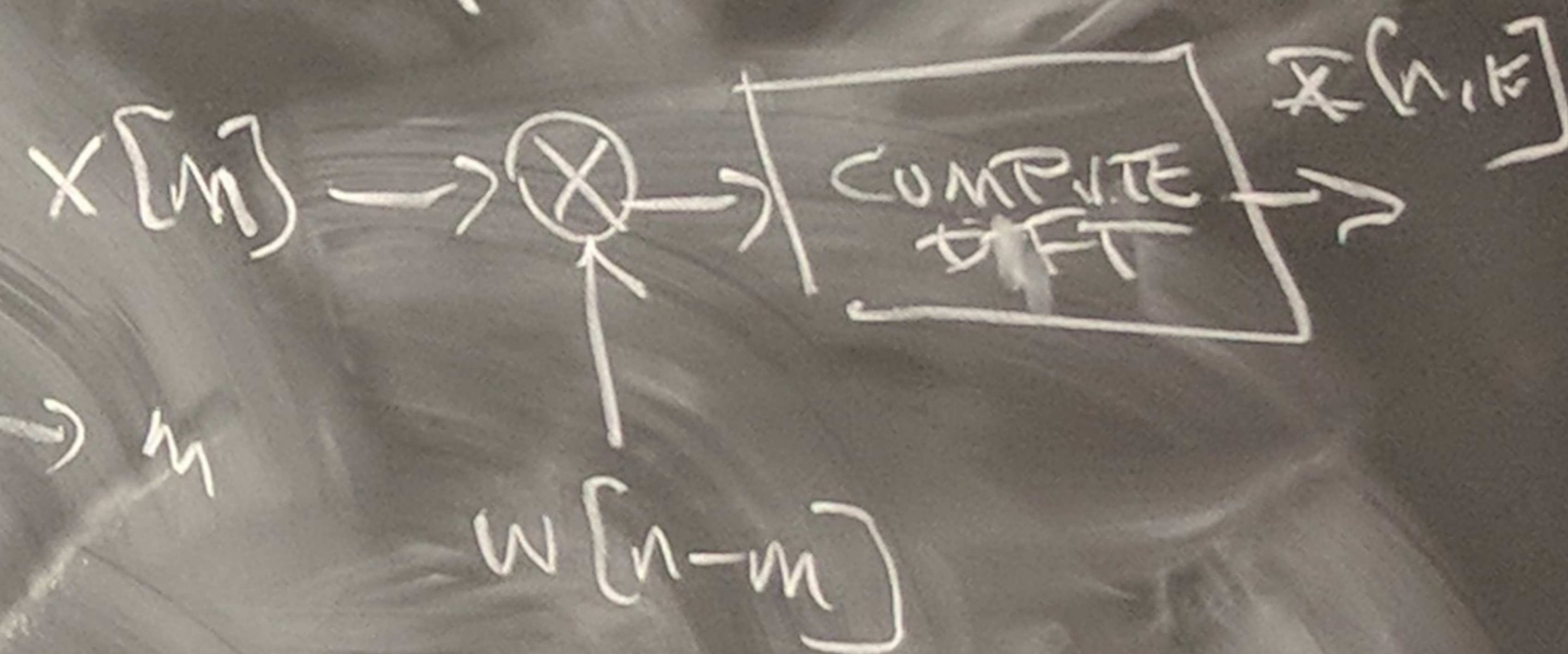
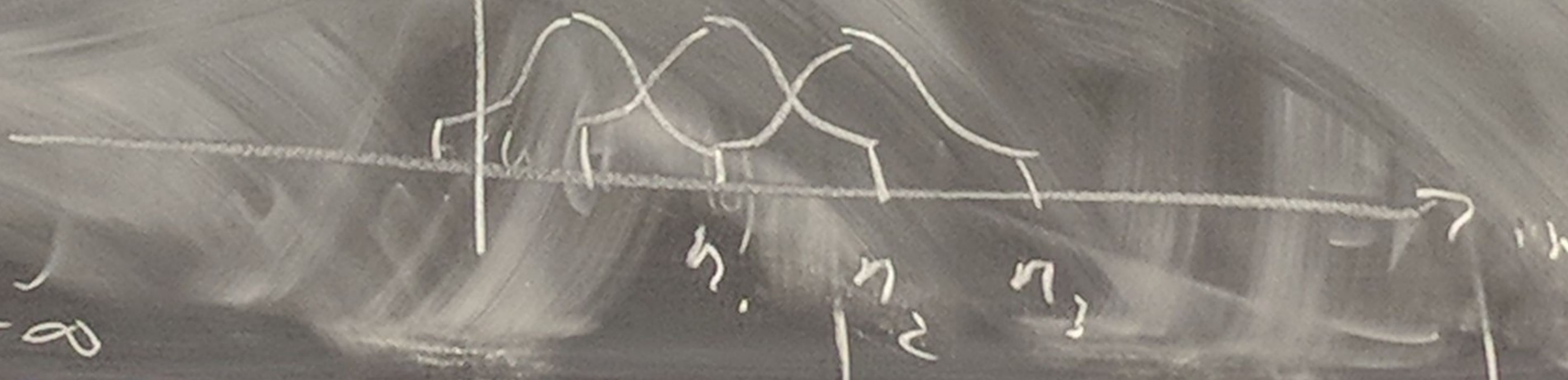
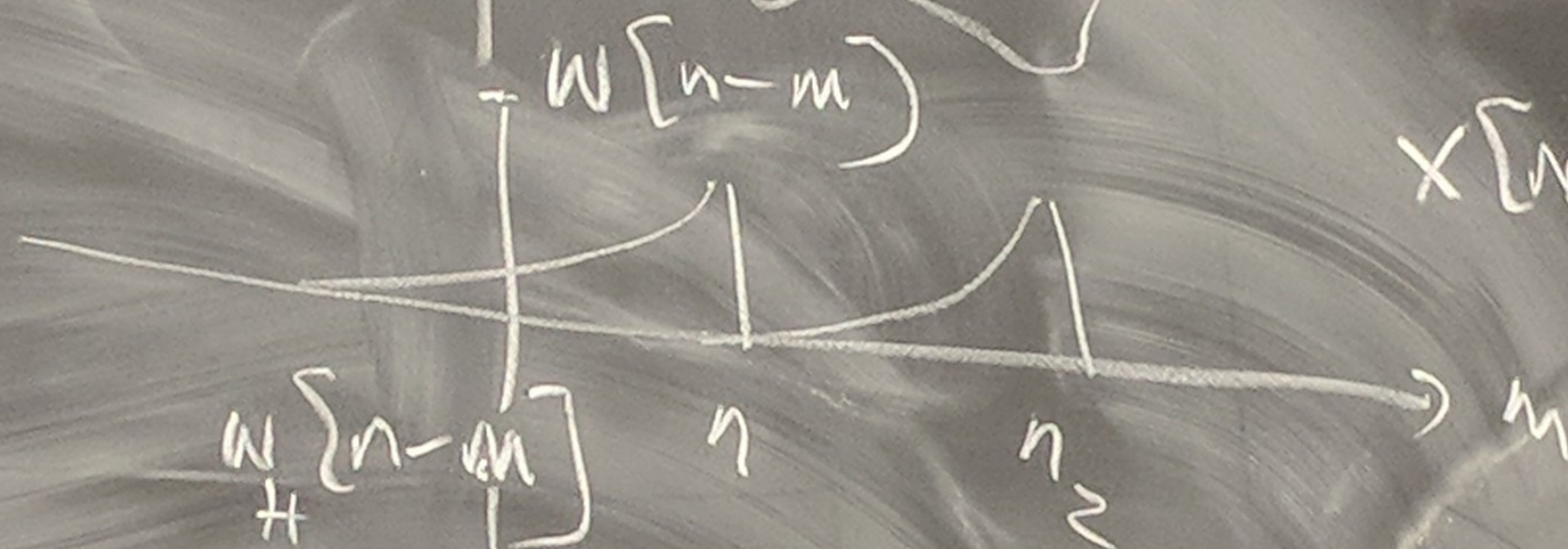
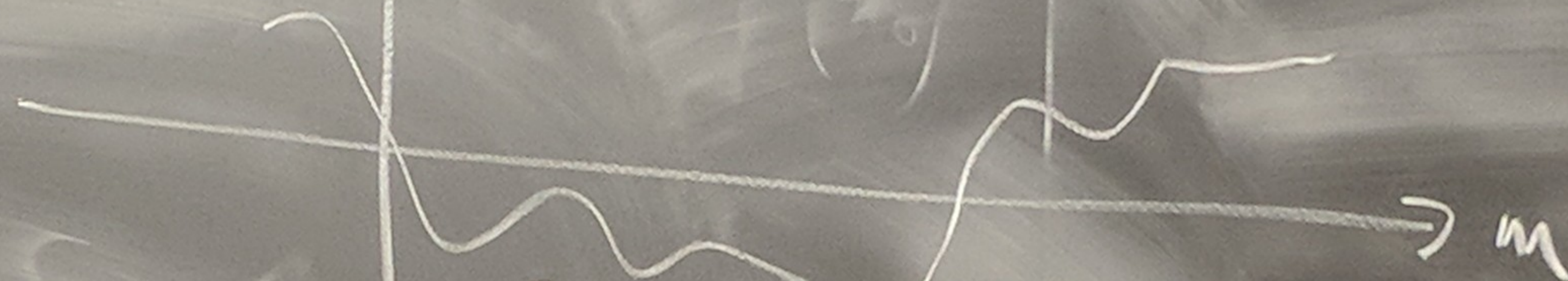
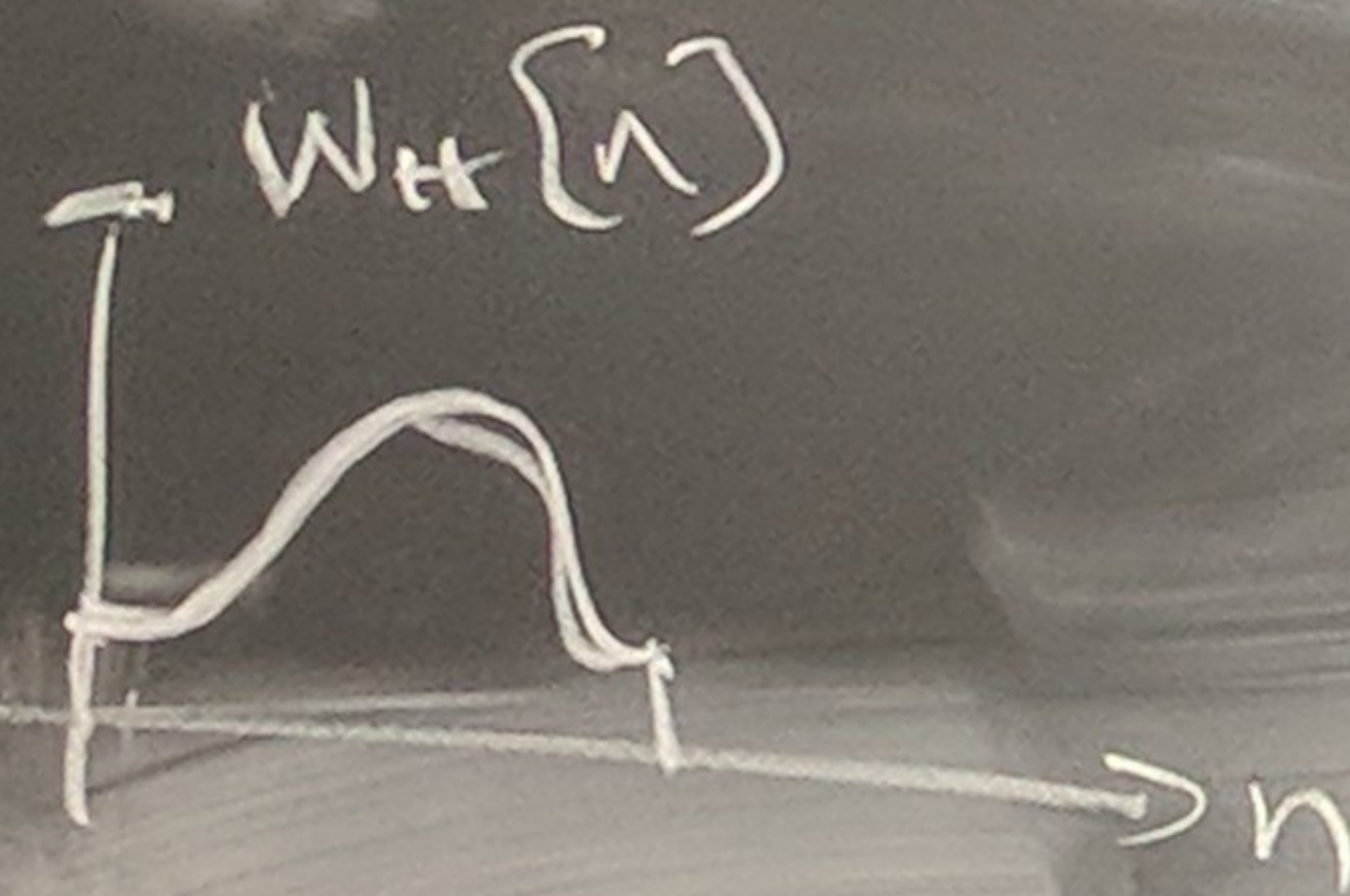
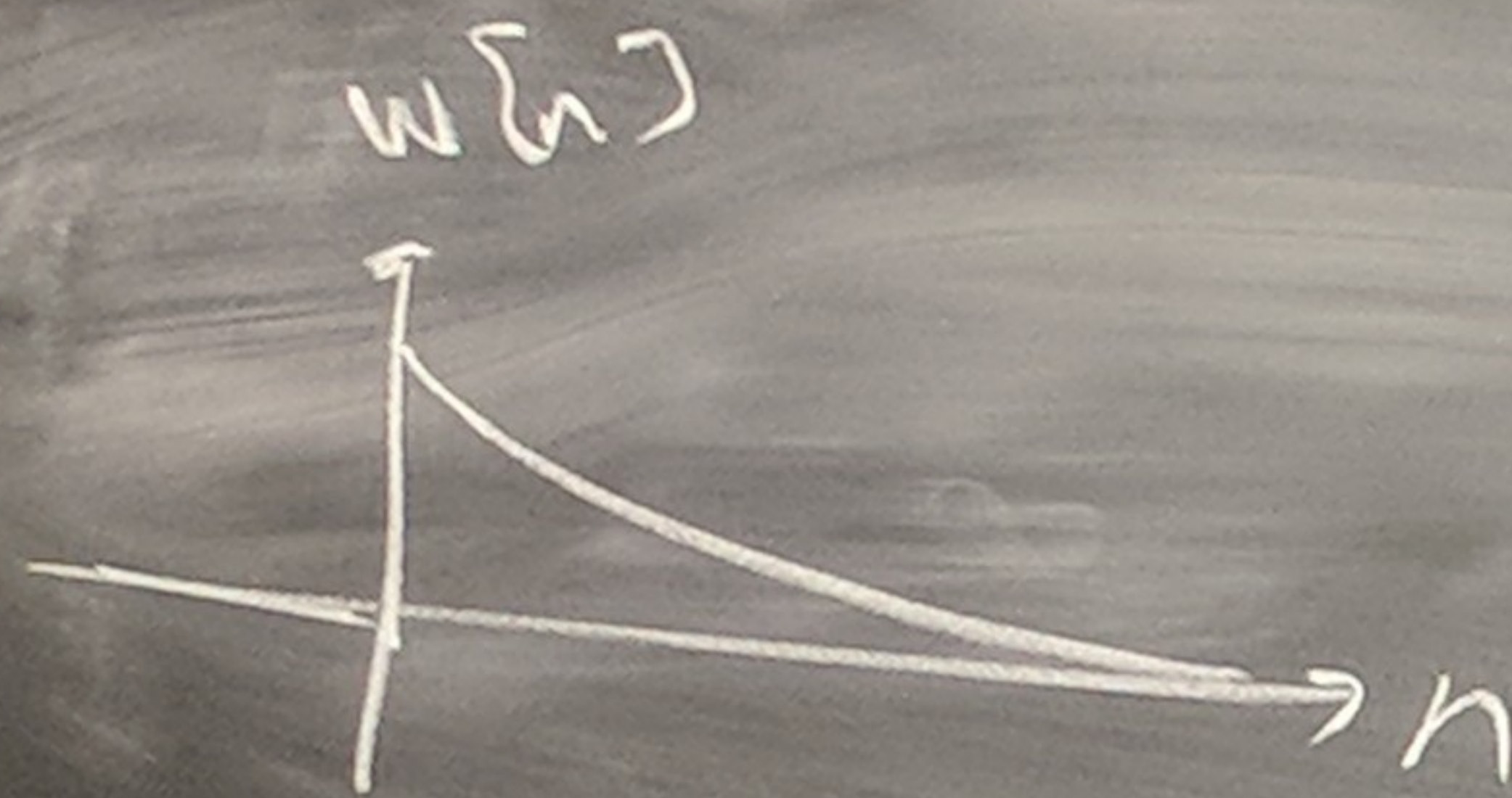
$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n}$$

$$x[n] = \frac{1}{N} \sum_{k=0}^{N-1} X[k] e^{j\frac{2\pi nk}{N}}$$

$$X[k] = \sum_{n=0}^{N-1} x[n] e^{-j\frac{2\pi nk}{N}}$$

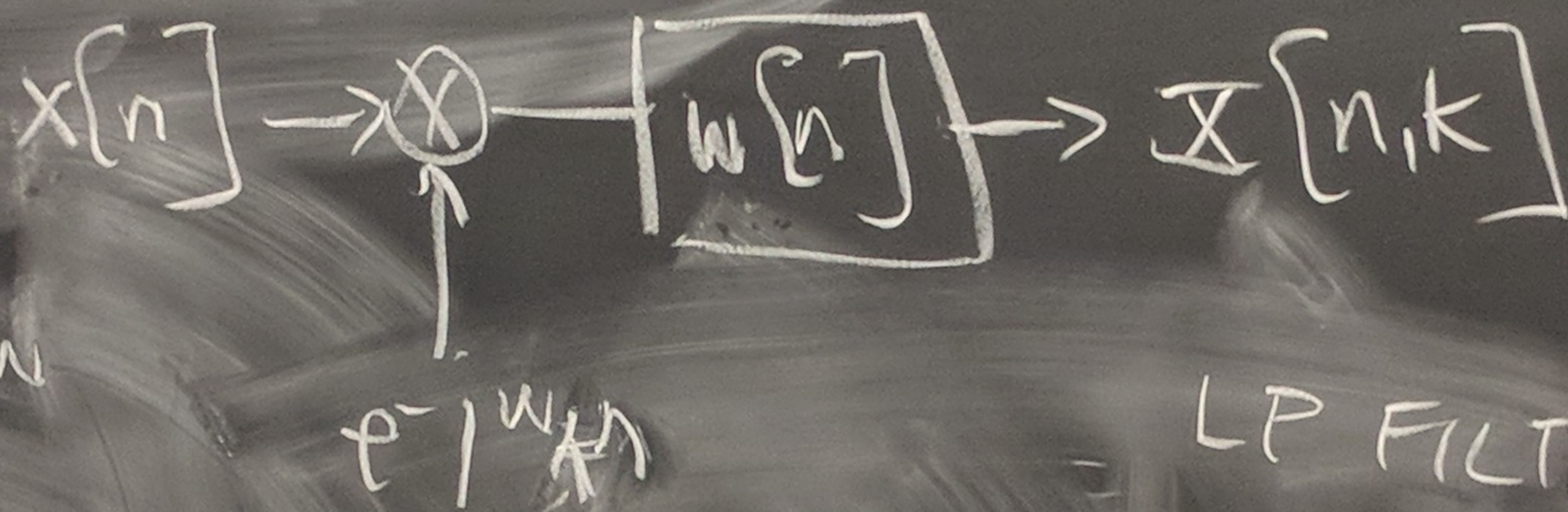
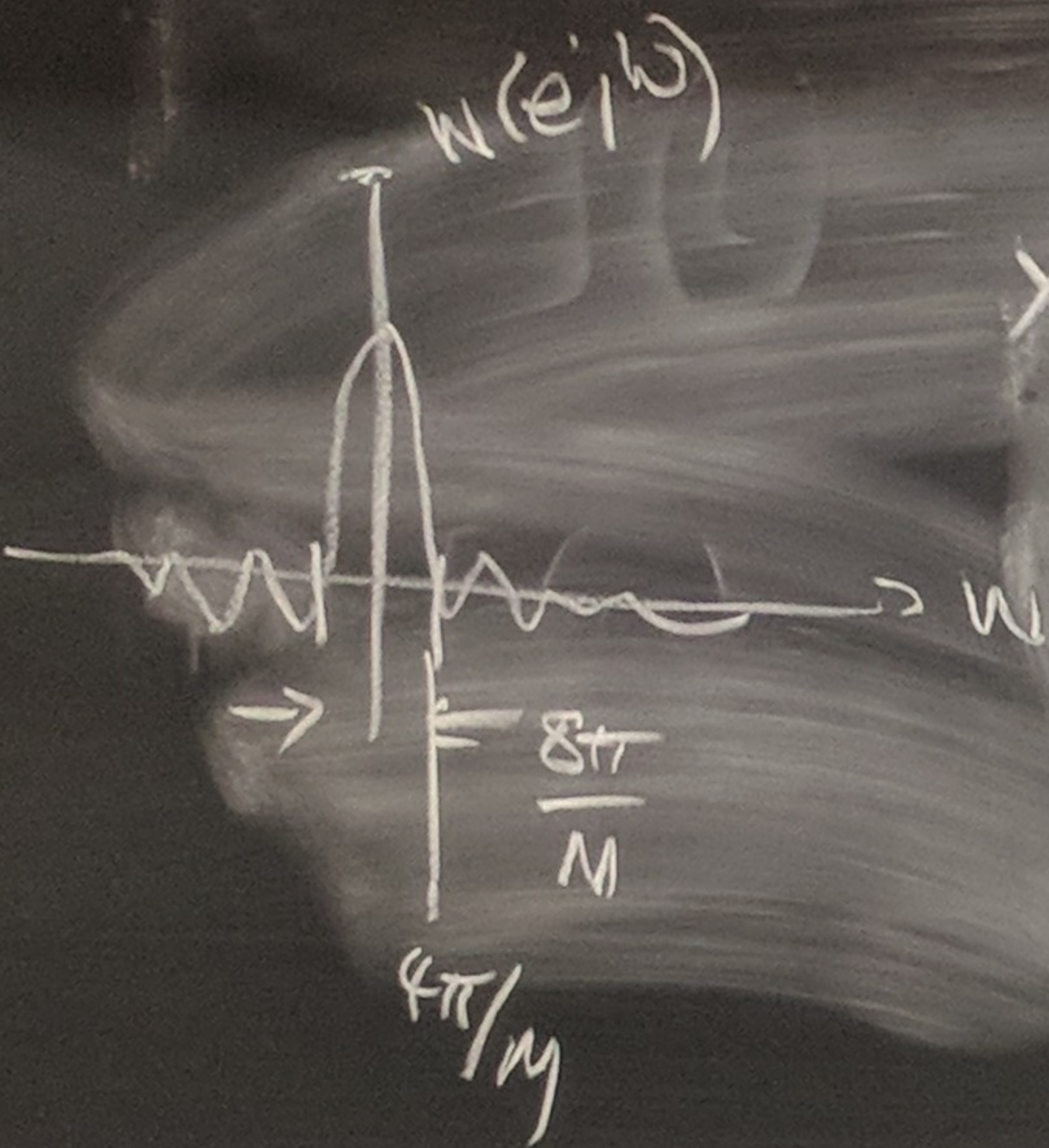
STFT

$$X(n, \omega) = \sum_{m=-\infty}^{\infty} w[n-m] x[m] e^{j\omega m}$$

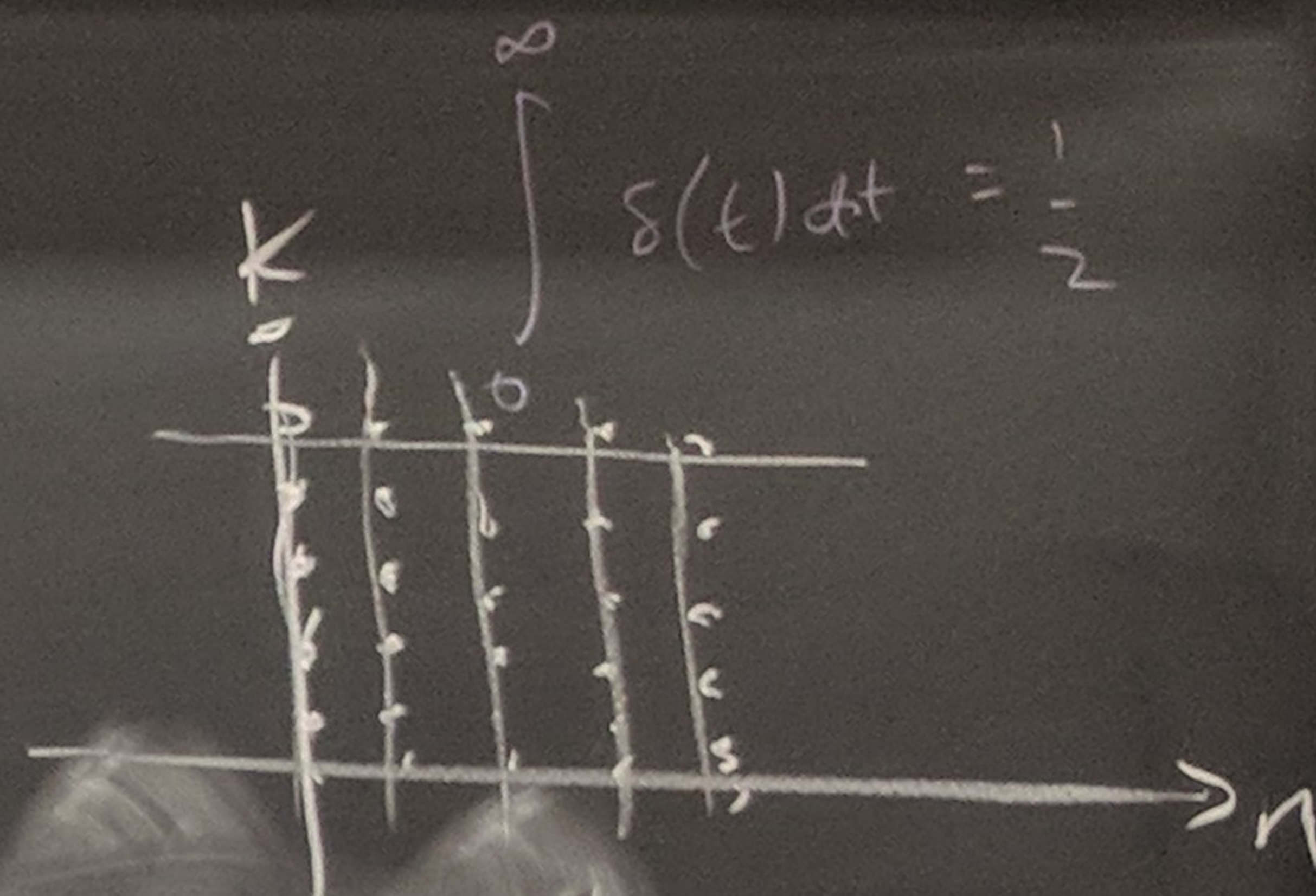


FOURIER XFORM
INTERP.

$$X[n, k] = \sum_{m=-\infty}^{\infty} w[n-m] (x[m] e^{-j\omega_k m})$$



LP FILTER INTERPRETATION



$$X[n, k] = \sum_{m=-\infty}^{\infty} w[n-m] x[m] e^{-j\omega_k m}$$

Let $l = n - m$
 $m = n - l$

$$= \sum_{l=-\infty}^{\infty} w[l] x[n-l] e^{-j\omega_k (n-l)}$$

$$= e^{-j\omega_k n} \sum_{l=-\infty}^{\infty} w[l] e^{j\omega_k l} \cdot x[n-l]$$

BP FILTER

INTERPRETATION

