

# Properties of CTFT

P.124

Note Title

3/1/2010

⑧ Convolution Property (Convolution in time  $\equiv$  Multiplication in freq)

$$\begin{aligned} x(t) &\longleftrightarrow X(j\omega) \\ y(t) &\longleftrightarrow Y(j\omega) \end{aligned}$$

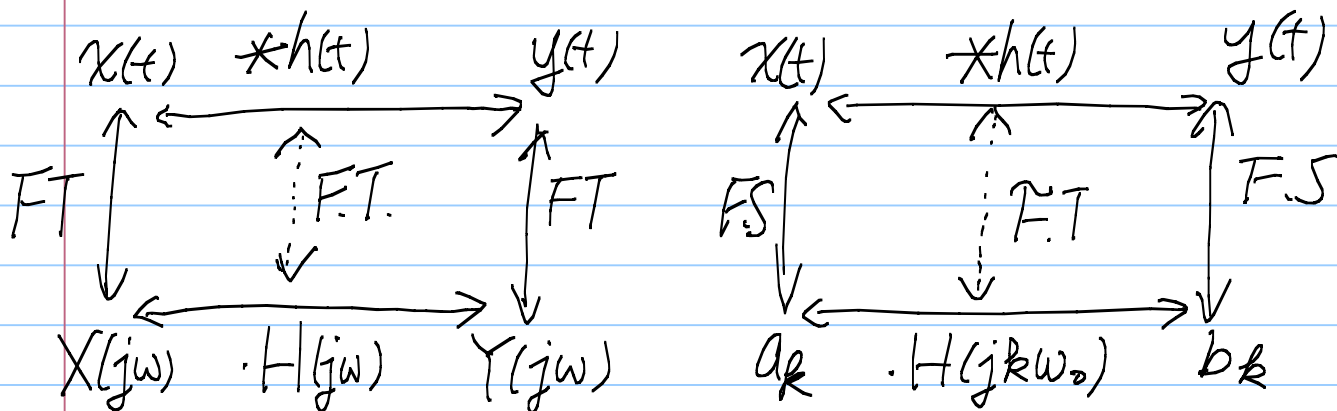
$$z(t) = x(t) * y(t) \longleftrightarrow Z(j\omega) \stackrel{?}{=} X(j\omega) \cdot Y(j\omega)$$

Comparison

aperiodic

VS.

periodic

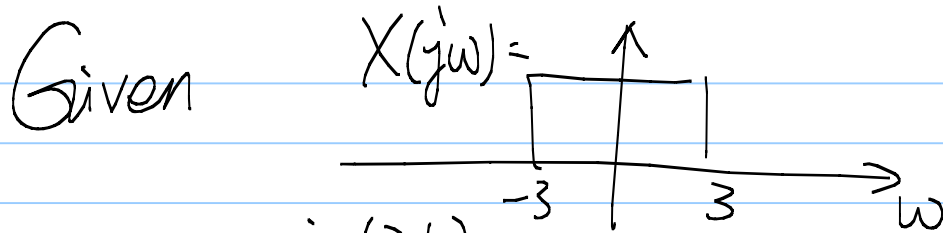


Now we have 2 methods to compute  $y(t)$

① By convolution  $y(t) = x(t) * h(t)$

② By F.T.

$$y(t) = \mathcal{F}^{-1}(X(j\omega) \cdot H(j\omega))$$

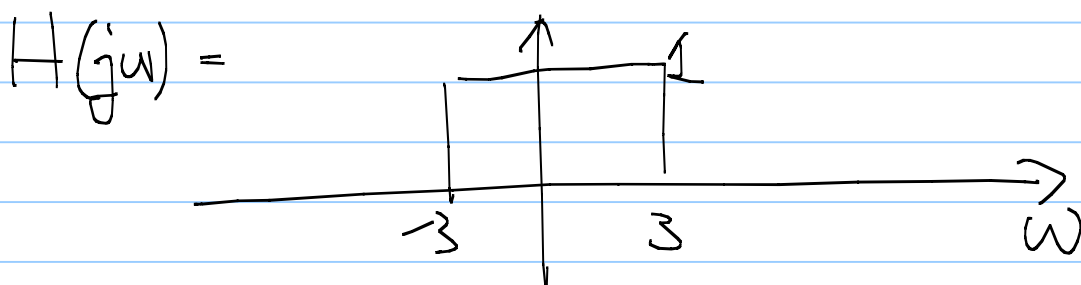
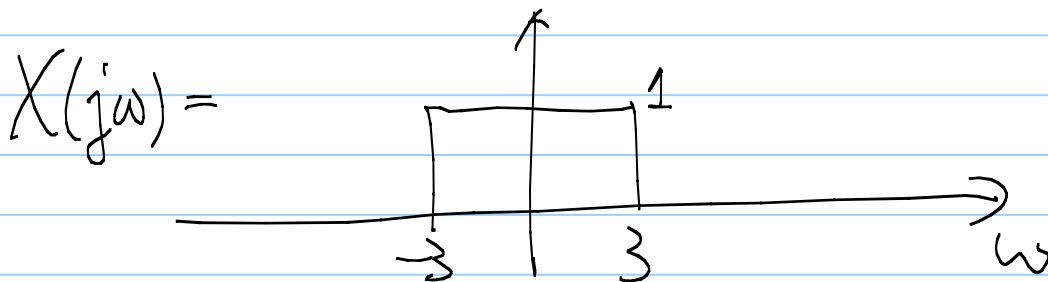
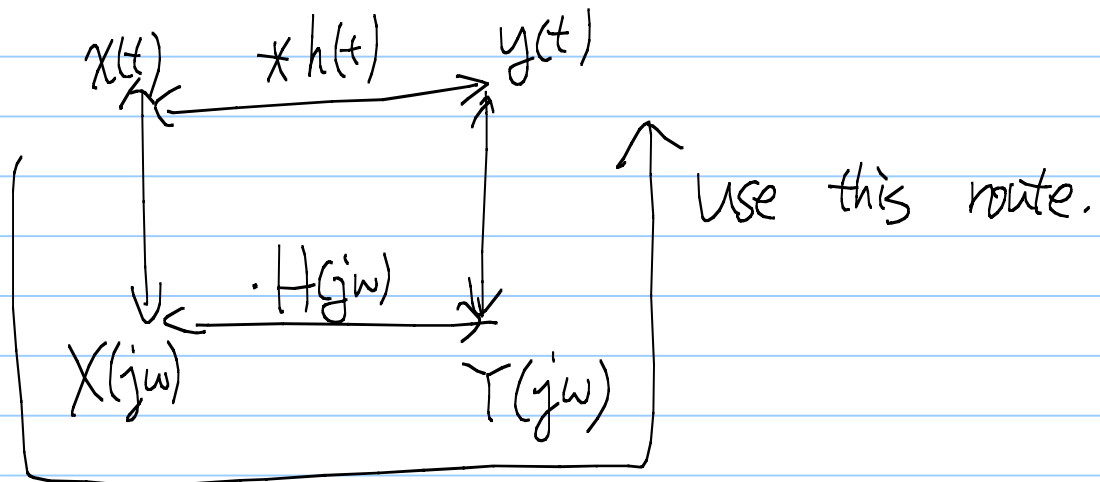


$$x(t) = \frac{\sin(3t)}{\pi t}$$

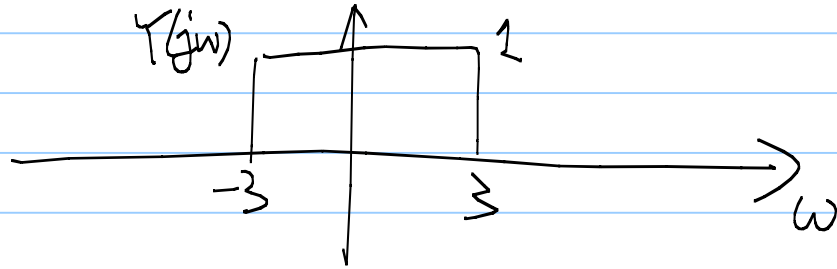
$$h(t) = \frac{\sin(3t)}{\pi t}$$

Q: Find  $y(t) = x(t) * h(t)$ .

Ans:  $Y(j\omega) = X(j\omega) \cdot H(j\omega)$



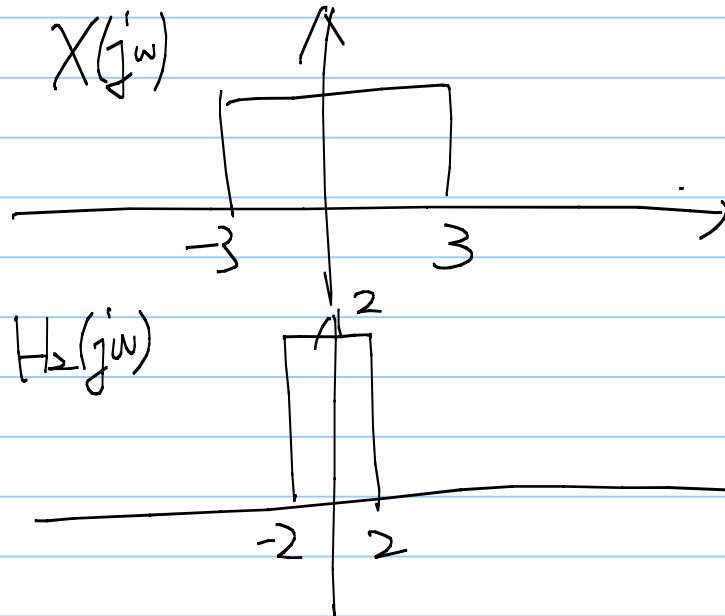
$$Y(j\omega) = X(j\omega) \cdot H(j\omega)$$



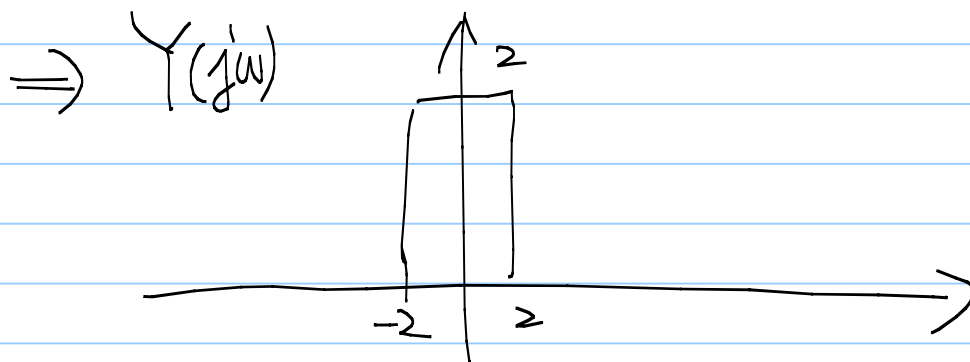
$$\Rightarrow y(t) = \frac{\sin(3t)}{\pi t} \quad \#$$

Q:  $h_2(t) = \frac{2\sin(2t)}{\pi t}$ , Find  $y_2(t) = X(t) * h_2(t)$

Ans:  $X(j\omega)$



Text  
by Example 4.5



$$\Rightarrow y(t) = \frac{2\sin(2t)}{\pi t} \quad \#$$