E Unit impulse: $x(t) = \delta(t)$

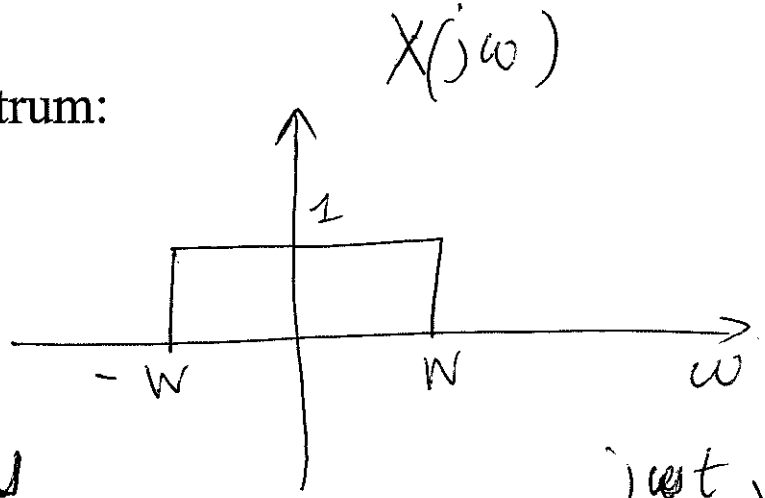
$$X(j\omega) = \int_{-\infty}^{\infty} \delta(t) e^{-j\omega t} dt = 1$$

E Inverse FT of an impulse spectrum: $X(j\omega) = 2\pi\delta(\omega)$

$$x(t) = \frac{1}{2\pi}\int_{-\infty}^{\infty} 2\pi\,\delta(\omega) e^{j\omega t} d\omega = 1$$

E Inverse FT of a rectangular spectrum:

$$X(j\omega)=\begin{cases}1, & |\omega|<W\\ 0, & |\omega|>W\end{cases}$$



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

$$=\frac{1}{2\pi}\int_{-W}^{W}e^{j\omega t}d\omega=\frac{1}{2\pi}\left(\frac{e^{j\omega t}}{jt}\right)\Bigg|_{-W}^{W}$$

$$=\frac{1}{2\pi}\left[\frac{e^{jWt}-e^{-jWt}}{jt}\right]=\frac{\sin Wt}{\pi t}$$

$$=\frac{W\sin\left(\pi\left(\frac{Wt}{\pi}\right)\right)}{\pi\left(\frac{Wt}{\pi}\right)}=\frac{\sin\left(\pi\left(\frac{Wt}{\pi}\right)\right)}{\pi\left(\frac{Wt}{\pi}\right)}=$$

$$\frac{W}{\pi}\operatorname{sinc}\frac{Wt}{\pi}$$

$$=\frac{W}{\pi}\frac{\sin\left(\pi\left(\frac{Wt}{\pi}\right)\right)}{\pi\left(\frac{Wt}{\pi}\right)}=$$