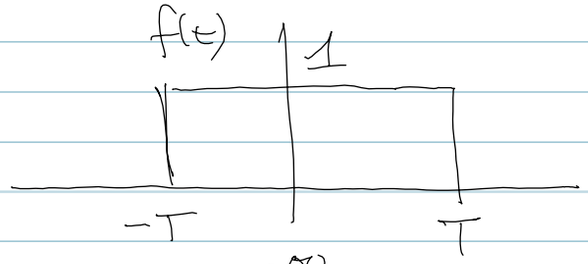
EG-247 End of Lecture Examples

FT. Part 2

Rectangular Pulse

(see also Exam 3)



$$F(\omega) = \int_{-\infty}^{\infty} f(t)\, e^{-j\omega t}\, dt$$

$$= \int_{-T}^{T} f(t) e^{-j\omega t}\, dt \qquad \boxed{f(t) = 1}$$

$$= -\frac{1}{j\omega}\left[e^{-j\omega t}\right]_{-T}^{T}$$

$$= -\frac{1}{j\omega}\left[e^{-j\omega T} - e^{+j\omega T}\right]$$

$$= \frac{2}{\omega}\left[\frac{e^{j\omega T} - e^{-j\omega T}}{j\,2}\right]$$

$$= \frac{2}{\omega}\,\sin \omega T \;\rightarrow\; 2T\left[\frac{\sin \omega T}{\omega T}\right]$$