



PROBLEM:

For each of the following cases, use the table of known Fourier transform pairs to complete the following Fourier transform pair relationships.

(a) Find $x(t)$ if $X(j\omega) = \frac{10}{1 + 0.5j\omega} e^{-2j\omega}$.

(b) Find $x(t)$ if $X(j\omega) = 5 \cos(100\omega)$.

(c) Find $x(t)$ if $X(j\omega) = \delta(\omega - 100\pi) + \delta(\omega + 100\pi)$.



$$a) \quad \frac{10}{1+0.5j\omega} = \frac{20}{2+j\omega} \Leftrightarrow x(t) = 20 e^{-2t} u(t)$$

$$\text{So: } \frac{10}{1+0.5j\omega} e^{-2j\omega} \Leftrightarrow x(t) = 20 e^{-2(t-2)} u(t-2)$$

$$b) \quad 5 \cos(100\omega) = \frac{5}{2} e^{j100\omega} + \frac{5}{2} e^{-j100\omega} \Leftrightarrow$$

$$x(t) = \frac{5}{2} \delta(t+100) + \frac{5}{2} \delta(t-100)$$

$$c) \quad \delta(\omega - 100\pi) + \delta(\omega + 100\pi) \Leftrightarrow$$

$$x(t) = \frac{1}{2\pi} e^{j100\pi t} + \frac{1}{2\pi} e^{-j100\pi t} =$$

$$= \frac{1}{\pi} \cos(100\pi t)$$