

PROBLEM:

The delay property of Fourier transform states that if $X(j\omega)$ is the Fourier transform of $x(t)$, the the Fourier transform of $x(t - t_d)$ is $e^{-j\omega t_d} X(j\omega)$, i.e.,

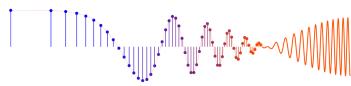
$$x(t - t_d) \iff e^{-j\omega t_d} X(j\omega).$$

Use this property to find the Fourier transforms of the following signals:

(a) $x(t) = \delta(t - 10)$

(b) $x(t) = \frac{\sin(5\pi(t - 10))}{\pi(t - 10)}$

(c) $x(t) = e^{-4t} u(t) - e^{-4t} u(t - 10) = e^{-4t} u(t) - e^{-40} e^{-4(t-10)} u(t - 10)$



a) $\delta(t-10) \Leftrightarrow X(j\omega) = e^{-j10\omega}$

b) $\frac{\sin 5\pi t}{\pi t} \Leftrightarrow X(j\omega) = [u(\omega+5\pi) - u(\omega-5\pi)]$

So: $\frac{\sin[5\pi(t-10)]}{\pi(t-10)} \Leftrightarrow X(j\omega) = e^{-j10\omega} [u(\omega+5\pi) + u(\omega-5\pi)]$

c) $e^{-4t} u(t) \Leftrightarrow X(j\omega) = \frac{1}{4+j\omega}$

So: $e^{-4t} u(t) - e^{-40} e^{-4(t-10)} u(t-10) =$

$$= \frac{1}{4+j\omega} - e^{-40} e^{-j10\omega} \frac{1}{4+j\omega} =$$

$$= \frac{1 - e^{-(40+j10\omega)}}{4+j\omega}$$