

Problem 16.1: For each signal below, you will plot the signal, find its Fourier transform, and plot the magnitude of its Fourier transform. Plot all three time-domain signals on the same figure. Plot all three frequency-domain plots on a second figure. Thus you will have two figures, each with three sketches. Use a straightedge and label all axes and important features. Show the origin for context.

(I.) $w(t) = e^{-2t}u(t)$

(II.) $x(t) = e^{-t}u(t)$

(III.) $y(t) = e^{-4t}u(t)$

Problem 16.2: Starting from the definition of the Fourier transform (i.e., the analysis equation), determine the Fourier transform of

$$x(t) = \begin{cases} 1, & |t| < 3 \\ 0, & \text{else} \end{cases}.$$

Plot the transform. Label all axes and important features. Show the origin for context.

Problem 16.3: Determine the signal $x(t)$ whose Fourier transform is

$$X(j\omega) = 2\delta(\omega - 3).$$

Optional, but testable, problems: From the textbook, Problems 4.1, 4.22, 4.23,