

1. **(4 pts Total)** Determine the Fourier Transform of  $x(t) = e^{-6t}u(t - 9)$ .
2. **(4 pts Total)** Let  $X(j\omega) = \cos(2\pi\omega)e^{-2|\omega|}$  be the Fourier Transform of  $x(t)$ .
  - (a) **(1 pts)** Is  $x(t)$  real, imaginary, or neither? Explain.
  - (b) **(1 pts)** Is  $x(t)$  even, odd, or neither? Explain.
  - (c) **(2 pts)** Calculate  $\int_{-\infty}^{\infty} x(t)dt$ .
3. **(12 pts Total)** A continuous-time LTI system has frequency response:

$$H(j\omega) = \begin{cases} |\omega| & \text{if } |\omega| < 30\pi \\ 0 & \text{if } |\omega| \geq 30\pi \end{cases} .$$

Let  $x(t) = 9 \cos(22t) + 4 \sin(7\pi t) + 19 \cos(243t)$  be the input to the system.

- (a) **(4 pts)** Determine and plot the Fourier Transform,  $X(j\omega)$ , of  $x(t)$ .
- (b) **(4 pts)** Determine and plot the Fourier Transform,  $Y(j\omega)$ , of the system output  $y(t)$ .
- (c) **(4 pts)** Determine the system output  $y(t)$ .