
2019 ES 156 Problem Set 6

Announcements

- Submission of your solution to this problem set are made electronically via Canvas no later than **10 am on Friday, March 29th, 2019** Late problem sets will be penalized (see syllabus).

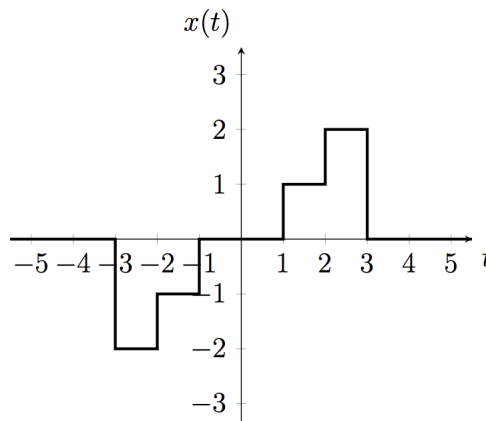
Problems

1. **[25 points]** Given the following continuous-time signals $x_1(t) = e^{-2t}u(t - 1)$ and $x_2(t) = e^{-3t}u(t + 1)$.
 - (a) Compute the convolution of the two signals $y(t) = x_1(t) * x_2(t)$.
 - (b) Compute the Fourier transform of $x_1(t)$ and $x_2(t)$.
 - (c) Suppose $\hat{Y}(j\omega) = X_1(j\omega)X_2(j\omega)$. Compute the associated continuous-time signal $\hat{y}(t)$. Are $y(t)$ from part (a) and $\hat{y}(t)$ equal?
2. **[25 points]** Suppose a continuous-time signal $x(t)$ has the following Fourier transform

$$X(j\omega) = \frac{d}{d\omega} \left(\frac{e^{-3j\omega}}{(2 + j(\omega - \frac{\pi}{3}))(2 + j(\omega + \frac{\pi}{3}))} \right).$$

Using the Fourier properties, determine the signal $x(t)$. At each juncture, indicate the properties you use.

3. **[10 points]** Consider the following signal



Compute the integral $\int_{-\infty}^{\infty} |X(j(\omega - \pi)) + X(j(\omega + \pi))|^2 d\omega$.

4. **[40 points+5 points]** Voice Recognition lab
See the Jupyter notebook on Canvas for details.