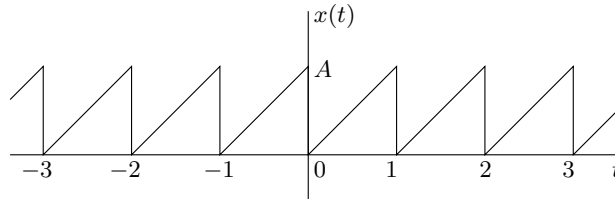


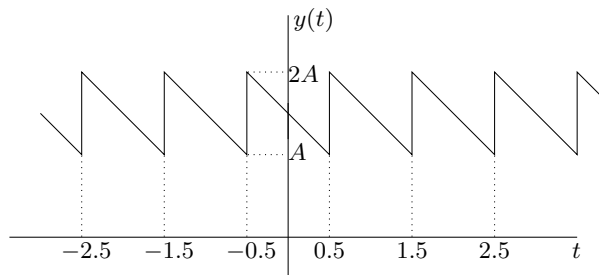
EC204: Networks & Systems

Problem Set 3

1. (a) Determine the coefficients of the Fourier series (in exponential form) of the periodic signal $x(t)$ shown below. Sketch the magnitude and phase spectrum.



- (b) Using the Fourier series for $x(t)$, determine the Fourier series coefficients for the periodic signal $y(t)$ shown below.



2. A linear time-invariant system has an impulse response $h(t) = 2e^{-2t}u(t)$, where $u(t)$ is the step function. Determine the system output if the input $x(t)$ is defined as

$$x(t) = \begin{cases} 1 & 2 \leq t \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

3. Sketch $y(t) = [u(t) \star u(t-2)] u(4-t)$, where $u(t)$ is the unit step function and \star denotes convolution.

4. $x(t) = \sum_{n=-\infty}^{\infty} c_n e^{j2\pi n t}$ and $y(t) = \sum_{n=-\infty}^{\infty} (-1)^n c_n e^{j2\pi n t}$. Express $y(t)$ in terms of $x(t)$.

5. Determine the coefficients of the Fourier series of the periodic signals $x_1(t)$ and $x_2(t)$ with period T_0 and defined in the interval $[-T_0/2, T_0/2)$ as follows.

$$x_1(t) = \begin{cases} A & |t| < d/2 \\ 0 & \text{otherwise} \end{cases}$$

$$x_2(t) = \begin{cases} A \sin(2\pi t/T_0) & 0 \leq t < T_0/2 \\ 0 & -T_0/2 \leq t < 0 \end{cases}$$

Sketch the magnitude and phase spectrum in each case.