Department of Electrical Engineering
School of Science and Engineering

# EE310 Signals and Systems

# TUTORIAL 3

## Tutorial 3-1

Consider the continuous-time, real-valued periodic signal $x(t)$ of fundamental period $T = 8$. The non-zero Fourier series coefficients of $x(t)$ are given by

$$a_1 = a_{-1}^* = j, \quad a_5 = a_{-5}^* = 2.$$

Express $x(t)$ in the form

$$x(t) = \sum_{k=0}^{\infty} A_k \cos(w_k t + \phi_k).$$

Review the conjugate symmetry of the Fourier-series coefficients that is implied by the fact the signal is real-valued.

## Tutorial 3-2

Consider the following CT or DT systems whose responses to a complex exponential input $e^{j5t}$ or $e^{j\pi/2n}$ are given by

$$\begin{aligned} &\text{System 1}: \quad e^{j5t} \to t\, e^{j5t}, \\ &\text{System 2}: \quad e^{j5t} \to t\, e^{j5(t-1)}, \\ &\text{System 3}: \quad e^{j\pi/2\,n} \to e^{j\pi/2\,n} u[n], \\ &\text{System 4}: \quad e^{j\pi/2\,n} \to e^{j5\pi/2\,n}. \end{aligned} \tag{1}$$

For each system, determine whether the given information is *sufficient* to conclude that the system is *not* linear and time-invariant.

## Tutorial 3-3

Determine the Fourier series coefficients of the continuous time periodic signal $z(t)$ shown in Fig. 1.

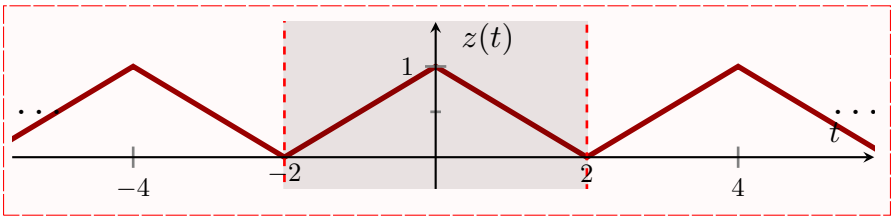


**Figure 1:** Signal $z(t)$.