



Department of Electrical Engineering
School of Science and Engineering

EE310 Signals and Systems

TUTORIAL 4

Tutorial 4-1

Let the Fourier series coefficients of continuous-time periodic signals $x(t)$ and $y(t)$ be denoted by a_k and b_k respectively. Express the Fourier coefficients b_k in terms of the Fourier coefficients a_k for the following signals.

(a) $y(t) = -2x(t) + jx(t)$

(b) $y(t) = x(t - 1)$

(c) $y(t) = x'(t) = \frac{d}{dt}x(t)$

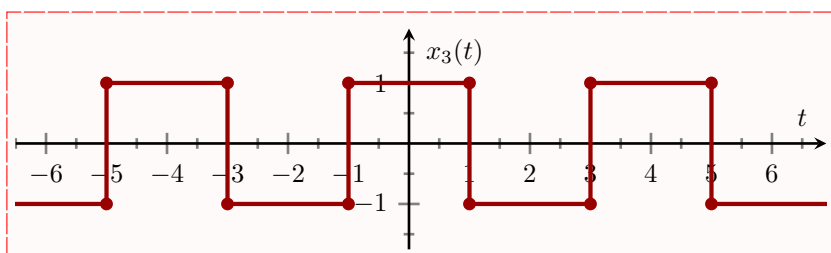
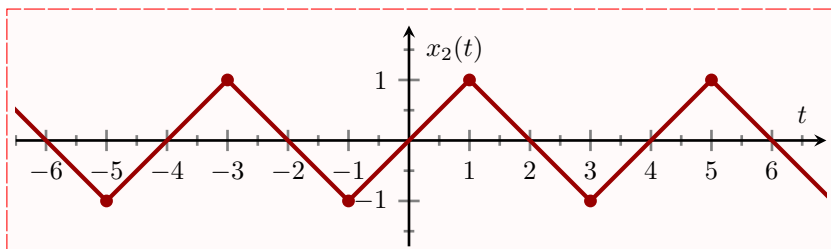
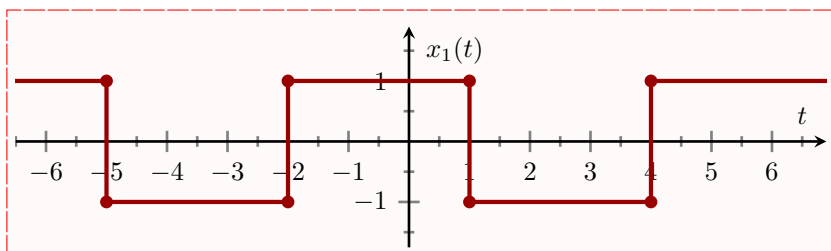
(d) $y(t) = x(1 - t)$

(e) $y(t) = x^2(t)$

Tutorial 4-2

Without evaluating the Fourier series coefficients, find which of the following periodic signals have Fourier coefficients with the following properties:

1. Only odd harmonics
2. Only real harmonics
3. Only imaginary harmonics



Tutorial 4-3

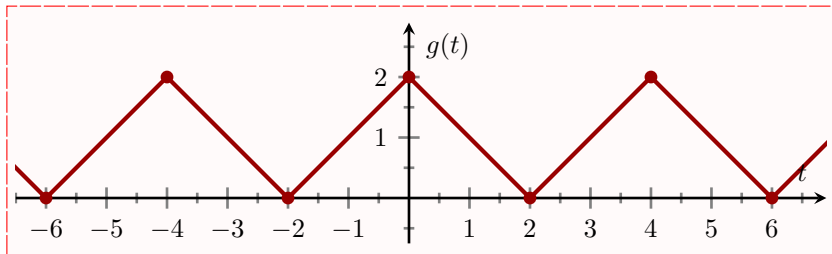
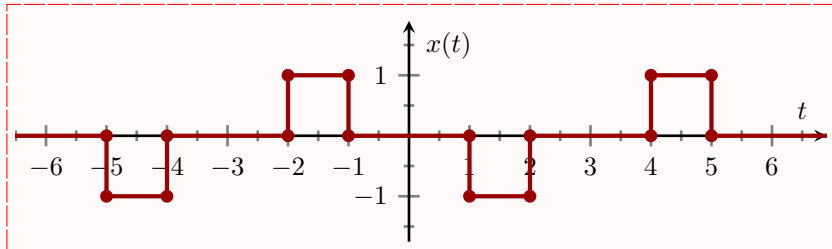
Given that the Fourier series coefficients of periodic impulse train defined as

$$y(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT),$$

are

$$b_k = \frac{1}{T},$$

determine the Fourier series of the coefficients of following signals $x(t)$ and $g(t)$:



Tutorial 4-4

Suppose we are given following information about a signal $x(t)$

1. $x(t)$ is real and odd
2. $x(t)$ is periodic with period $T = 2$
3. The Fourier coefficients are a_k , such that $a_k = 0$ for $k > 1$
4. $\frac{1}{2} \int_0^2 |x(t)|^2 dt = 1$

Specify two different signals that satisfy these conditions.