EE 2000 Assignment # 6

(taken from Dr. Jingxian Wu, University of Arkansas, 2020.)

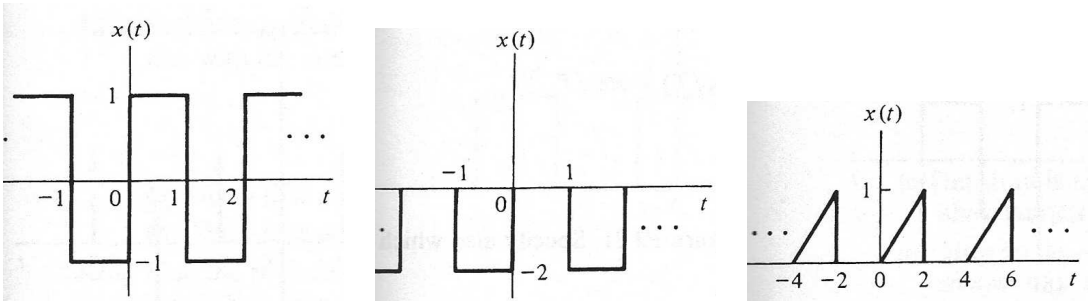
1. For the periodic signal

$$x(t) = 2 + \frac{1}{3}\cos\left(t + \frac{\pi}{6}\right) + 2\cos(3t) - 2\sin\left(5t + \frac{\pi}{6}\right) \qquad (1)$$

   (a) Find the Fourier series

   (b) Use Matlab to sketch the magnitude and phase spectra as a function of the angular frequency Ω.

2. Find the Fourier series representation of the signals shown in Fig. 1. Plot the magnitude and phase spectrum for each case.



(a) (b) (c)

Figure 1: Question 2

3. The signal shown in Figure 2 (next page) is created with a sine voltage is rectified by a circuit with two diodes, a process known as full-wave rectification. Find the Fourier series of the signal. (Hint: $x(t) = \sin(t), 0 < t < \pi$. $x(t)$ can be expressed as complex exponentials with Euler's formula).

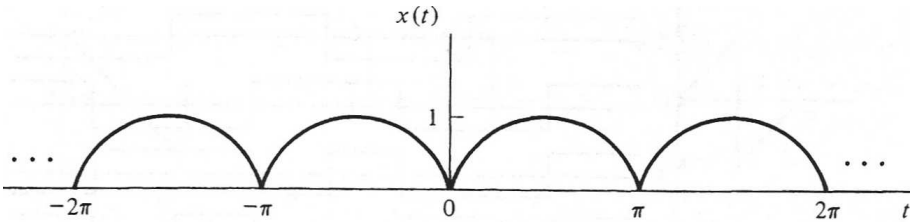


Figure 2: Question 3