Signals and Systems

Assignment 3

Spring 2021

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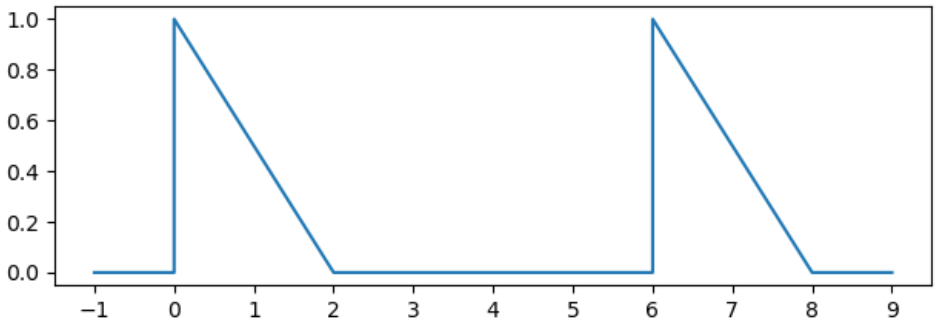
Question 1

Determine the Fourier Series coefficients a_k for the following periodic signals:

(a) $x(t) = 3cos(\frac{2\pi t}{3} + \frac{\pi}{3}) + 5sin(\frac{2\pi t}{18})$

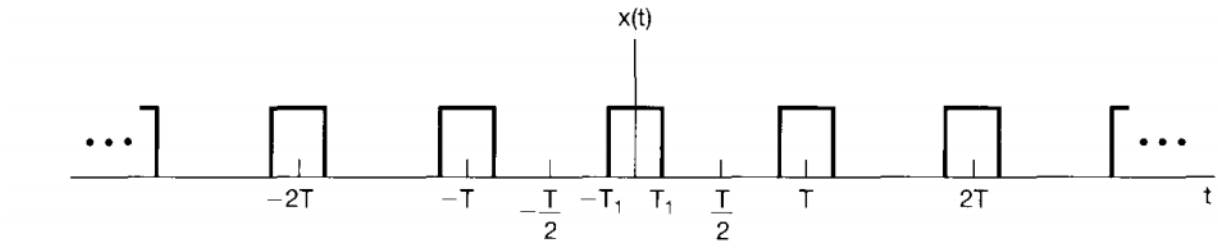
(b) $x(t) = 2sin(\frac{2\pi t}{3} + \frac{\pi}{6})$

(c) (Using the definition integral)

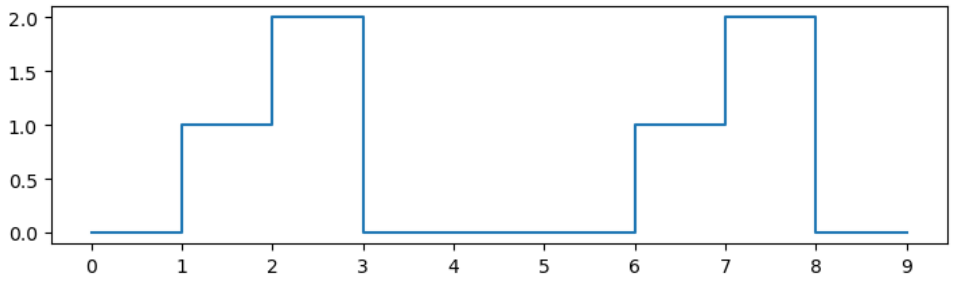


Question 2

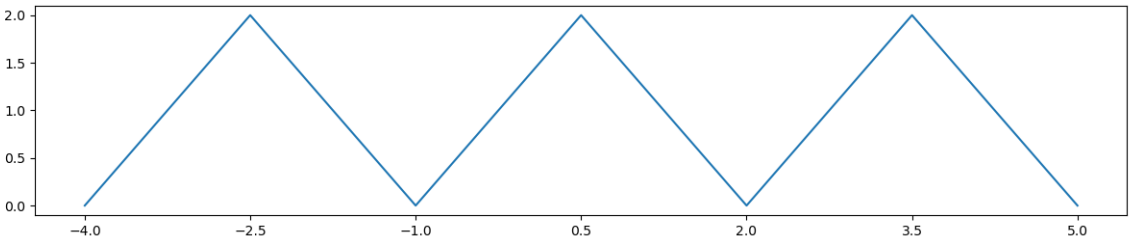
Determine the Fourier Series coefficients a_k for $x(t)$:



(a) .



(b) .



Question 3

(Textbook Section 3.8 - Fourier Series and LTI Systems)

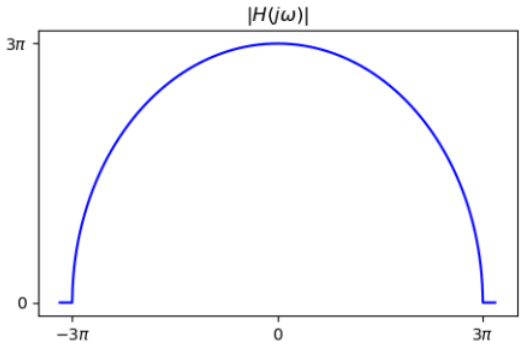
Consider a signal $x(t)$ with Fourier Series representation like this:

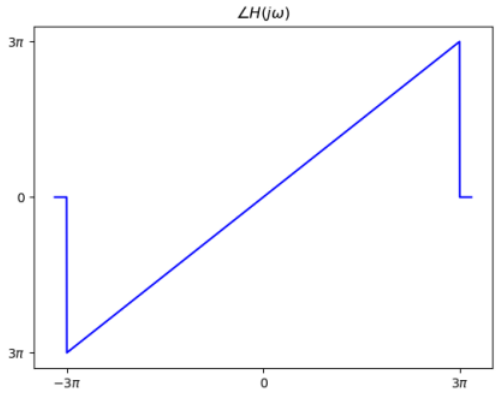
$$a_{-2} = a_2 = \frac{1}{16}$$

$$a_{-1} = a_1 = \frac{1}{8}$$

$$a_0 = 1$$

And otherwise $a_k = 0$. Keep in mind that $T = 4$. Consider an LTI System with frequency response $H(j\omega)$ as plotted below.





(a) Determine the output $y(t)$, and its Fourier Series coefficients b_k, if we apply $x(t)$ as input.

(b) Using Parseval's relation, determine the average power of $y(t)$.