

## HW Assignment 2

Due date: Thursday 24/3/2016

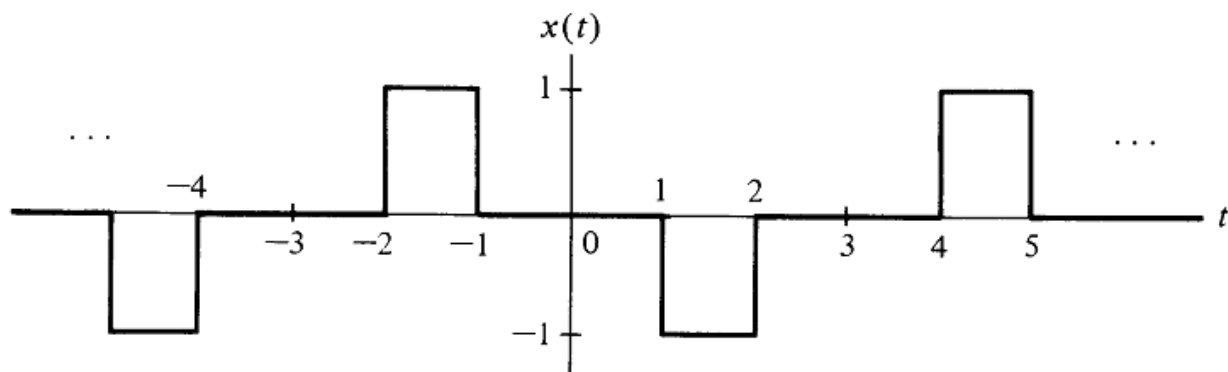
### Question 1

Find The complex Fourier series coefficients for each of the following signals (note the choice of  $\omega_0$  explicitly):

1.  $x(t) = 1 + \cos\left(5\pi t + \frac{\pi}{3}\right)$
2.  $x(t) = \cos^2\left(\frac{\pi}{2}t\right)\sin(\pi t)$
3.  $x(t) = (1 + \sin(2\pi t))\cos\left(4\pi t + \frac{\pi}{3}\right)$

### Question 2

Calculate the complex Fourier series of the following signal. Which coefficients are zero? Can you make any observation about the coefficients decay rate?



### Question 3

Calculate the complex Fourier series of the following signal:

$$f(t) = \begin{cases} t^2 & |t| < 1 \\ 0 & \text{else} \end{cases}$$

Can you make any observation about the coefficients decay rate? Compare it to the coefficients decay rate from Question 3.

### Question 4

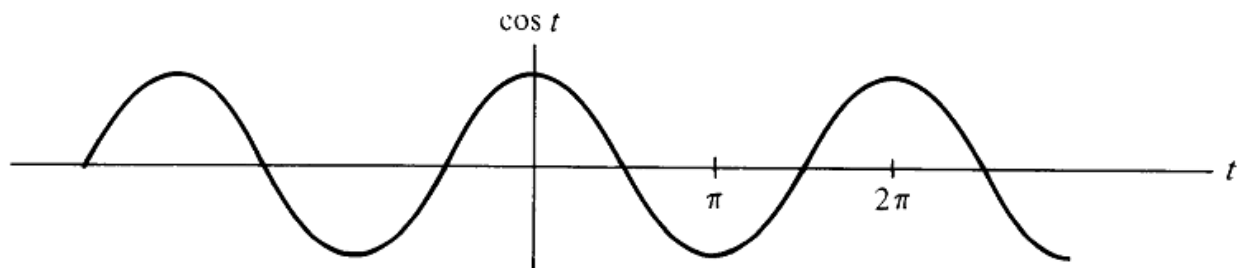
Prove the following properties

- If  $f(t) \in \mathbb{R}$  then  $d_n = d_{-n}^*$ .
- if  $f(t) = f(-t)$  then  $d_n \in \mathbb{R}$ .
- if  $f(t) = -f(-t)$  then  $d_n \in j\mathbb{R}$ .
- linearity: if  $\begin{cases} f(t) \leftrightarrow d_n \\ g(t) \leftrightarrow c_n \end{cases}$  then  $\alpha f(t) + \beta g(t) \leftrightarrow \alpha d_n + \beta c_n$ .

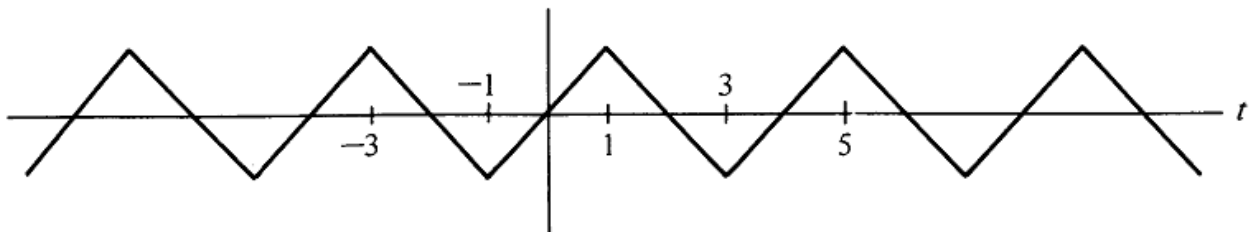
**Question 5**

which of the following has pure/imaginary Fourier coefficients?

1.



2.



3.

