GATE IN-13 2022

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Q: A periodic function $f(x)$, with period 2, is defined as

$$f(x) = \begin{cases} -1 - x & -1 \le x < 0 \\ 1 - x & 0 < x \le 1 \end{cases} \tag{1}$$

The Fourier series of this function contains

A. Both $cos(n\pi x)$ and $sin(n\pi x)$ where n=1,2,3...
B. Only $sin(n\pi x)$ where n=1,2,3...
C. Only $cos(n\pi x)$ where n=1,2,3...
D. Only $cos(2n\pi x)$ where n=1,2,3... $(GATE - 2022 - IN)$

Solution:

$$f(x) = \begin{cases} -1 - x & -1 \le x < 0 \\ +1 - x & 0 < x \le 1 \end{cases} \tag{2}$$

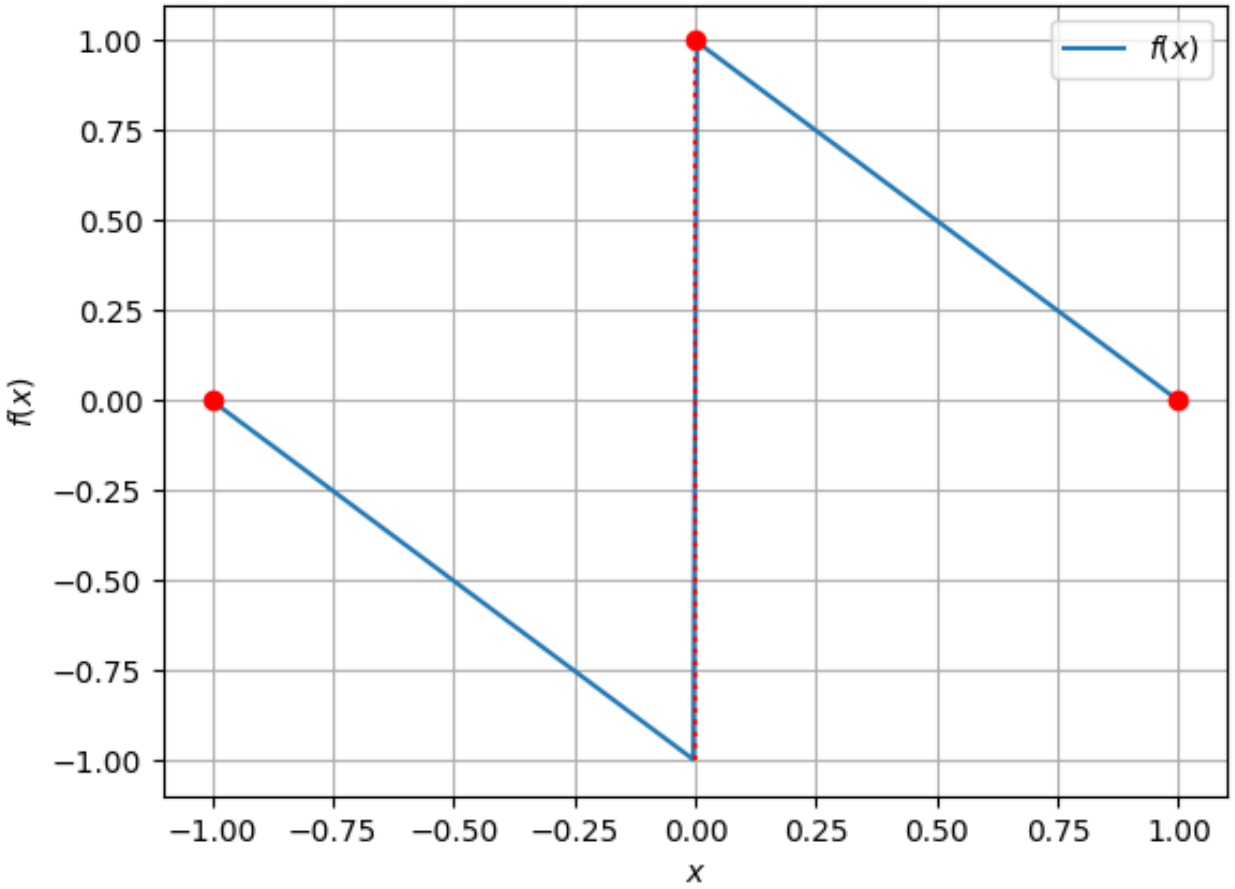

Fig. 4.

$$f(-x) = -f(x) \tag{3}$$

So, The function f(x) is odd function.
Since the function is aperiodic, The function f(x) doesn't have halfwave symmetry.
So, only sine terms will be present in fourier series of this function f(x).

$f(x) = sin(n\pi x)$ where n=1,2,3...