ECN-203: Signals & Systems (CSE)
Quiz 1

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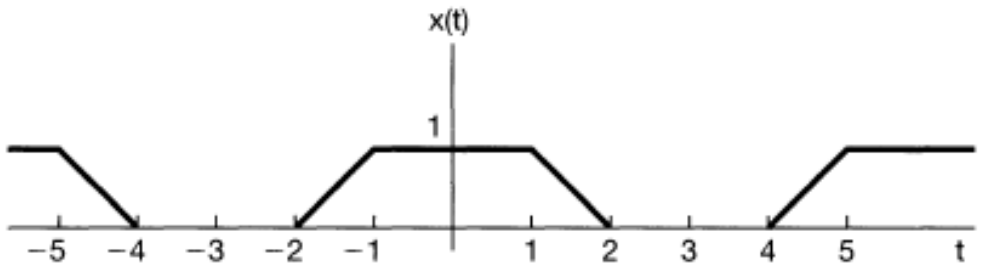
1. Given that the Fourier series coefficients $a_k s$ of a periodic square wave defined over one period as $y(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & T_1 < |t| < \frac{T}{2} \end{cases}$ are $a_0 = \frac{2T_1}{T}$, and $a_k = \frac{sin(k\omega_0 T_1)}{k\pi}$ for $k \neq 0$, find the Fourier series coefficients $b_k s$ of the following periodic signal. (Marks: 10)



2. Let $x(t) = cos(4\pi t)$ and $y(t) = sin(6\pi t)$.
   (a) Find Fourier series coefficients of $x(t)$ and $y(t)$. (Marks: 4)
   (b) Find Fourier series coefficients of $z(t) = x(t) \times y(t)$. You may use any property of the Fourier series with justification. (Marks: 6)

3. Let $x(t)$ be a real periodic signal ($T = 6$) which follows $x(t) = -x(t-3)$. Fourier series coefficients of $x(t)$ are real and positive and are zero for $|k| > 2$. Given the average power in one time period of the signal $x(t)$ is 1, find the signal $x(t)$. (Marks: 10)