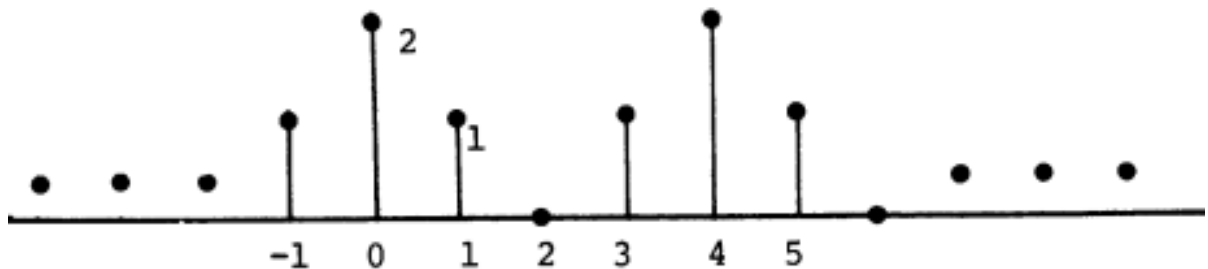
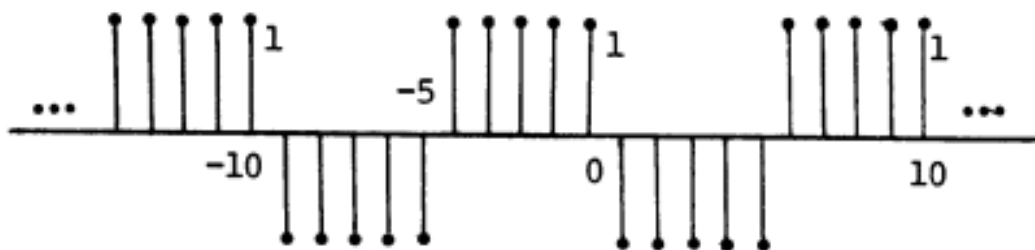


1. The below graph describes the period 3, sequence $\{\tilde{x}_n\}_{n \in \mathbb{Z}}$,



Determine the Fourier Coefficients $\tilde{X}_k : k = 0, 1, 2, 3$.

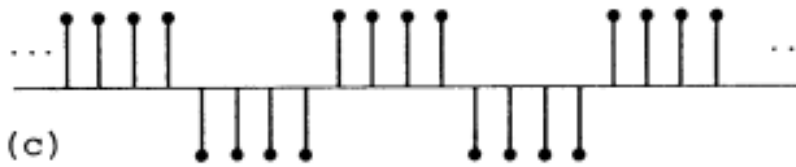
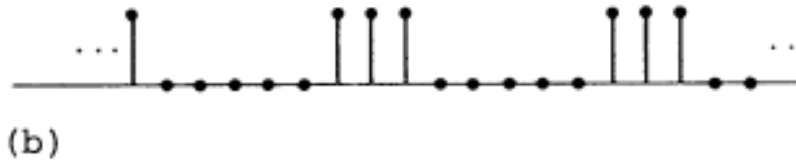
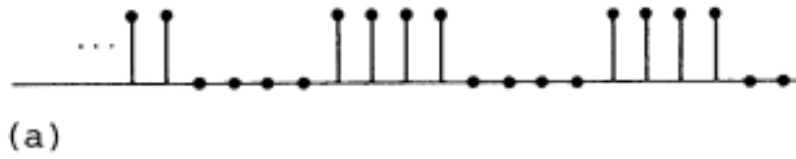
2. The below graph describes the periodic sequence $\{\tilde{x}_n\}_{n \in \mathbb{Z}}$,



Without explicitly evaluating the Fourier coefficients \tilde{X} , decide which of the following are true

- (a) $\tilde{X}_k = \tilde{X}_{k+10}$ for all k .
- (b) $\tilde{X}_k = \tilde{X}_{-k}$ for all k .
- (c) $\tilde{X}_0 = 0$.
- (d) $\tilde{X}_k = \exp(i \frac{2\pi k}{5})$ is real for all k .

3. The below graph describes three periodic sequence $\{\tilde{x}_n\}_{n \in \mathbb{Z}}$,



Suppose the sequences can be expressed in terms of their Fourier coefficients as

$$\tilde{x}_n = \frac{1}{N} \sum_{k=0}^{N-1} X_k \exp(i \frac{2\pi nk}{N})$$

- (a) For which sequences can the time origin be chosen such that all the X_k are real ?
- (b) For which sequences can the time origin be chosen such that all the X_k for $k \neq 0$ are imaginary ?