

11.9.3.6

EE23BTECH11022 - G DILIP REDDY

Question:

For what values of x , the numbers $-\frac{2}{7}, x, -\frac{7}{2}$ are in G.P ?

Solution:

Let r be the common ratio

$$\Rightarrow \frac{x}{\left(-\frac{2}{7}\right)} = \frac{\left(-\frac{7}{2}\right)}{x} = r$$

$$x^2 = \left(-\frac{2}{7}\right) \cdot \left(-\frac{7}{2}\right)$$

$$x^2 = 1$$

$$x = 1, -1$$

$$r = \frac{x}{\left(-\frac{2}{7}\right)}$$

$$\Rightarrow r = \frac{7}{2} \text{ or } -\frac{7}{2}$$

$$x_n = -\frac{2}{7} \cdot \left(-\frac{7}{2}\right)^n \text{ or } -\frac{2}{7} \cdot \left(\frac{7}{2}\right)^n$$

$$x_n = \left(-\frac{7}{2}\right)^{n-1} \text{ or } -\left(\frac{7}{2}\right)^{n-1}$$

The signal corresponding to this is

$$x_1(n) = \left(-\frac{7}{2}\right)^{n-1} u(n)$$

$$x_2(n) = -\left(\frac{7}{2}\right)^{n-1} u(n)$$

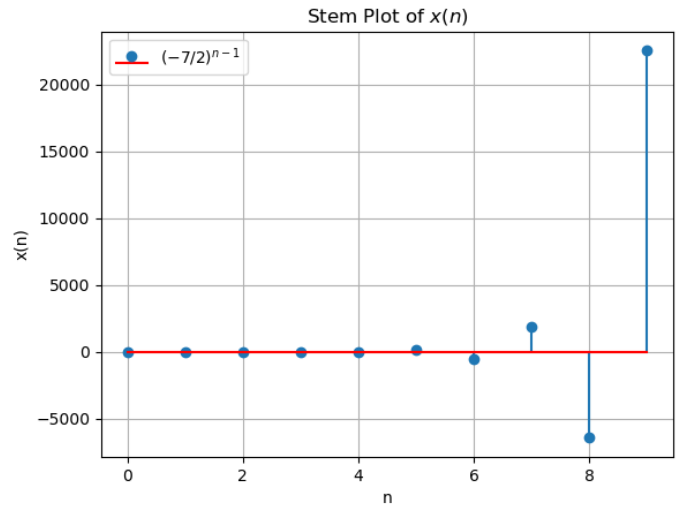


Fig. 1: Stem Plot of $x_1(n)$

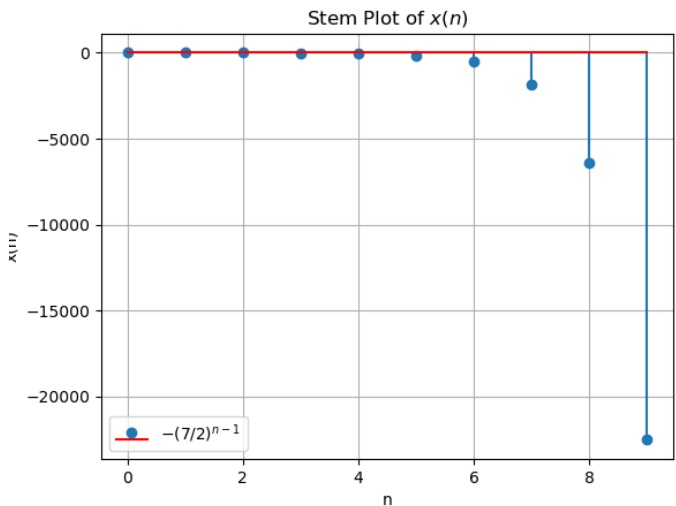


Fig. 2: Stem Plot of $x_2(n)$

Variable	Description	Value
$x(0)$	First term of the GP	$-\left(\frac{2}{7}\right)$
r	Common ratio of the GP	
$x(n)$	General term	

TABLE 1: Variables Used

Applying z-Transform :

$$x(n) \xrightarrow{Z} X(z) \quad (12)$$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n} \quad (13)$$

$$\text{ROC} : z \in \left(-\infty, -\frac{7}{2}\right) \cup \left(\frac{7}{2}, \infty\right)$$

$$\Rightarrow X_1(z) = \left(\frac{1}{7}\right) \left(\frac{4z}{7+2z}\right) \quad (14)$$

$$\Rightarrow X_2(z) = \left(\frac{1}{7}\right) \left(\frac{4z}{7-2z}\right) \quad (15)$$