

EE23BTECH11047 - Deepakreddy P

17 If a, b, c, d are in G.P, prove that $(a^n + b^n), (b^n + c^n), (c^n + d^n)$ are in G.P and find the Z transform of General term of G.P.

Solution:

TABLE I
INPUT PARAMETERS

Symbol	Input value
$x(0)$	$x(0)r^0$
$x(1)$	$x(0)r^1$
$x(2)$	$x(0)r^2$
$x(3)$	$x(0)r^3$

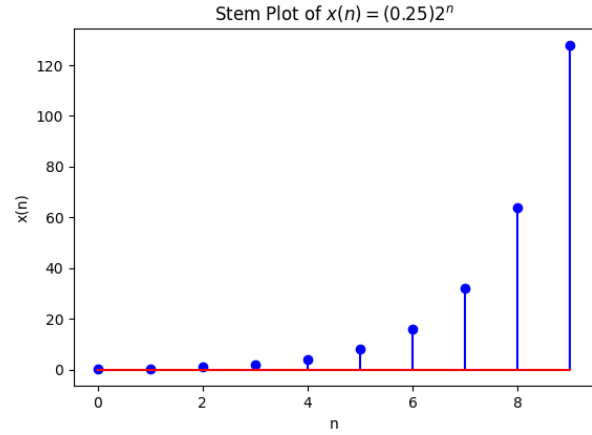


Fig. 1. Plot of $x(n)$ vs n

$$= \frac{x(1)^n + x(2)^n}{x(0)^n + x(1)^n} \quad (1)$$

$$= \frac{(x(0)r^1)^n + (x(0)r^2)^n}{(x(0)r^0)^n + (x(0)r^1)^n} \quad (2)$$

$$= \frac{x(0)^n r^n (1 + r^n)}{x(0)^n (1 + r^n)} \quad (3)$$

$$= \frac{x(0)^n r^{2n} (1 + r^n)}{x(0)^n r^n (1 + r^n)} \quad (4)$$

$$= \frac{(x(0)r^2)^n + (x(0)r^3)^n}{(x(0)r^1)^n + (x(0)r^2)^n} \quad (5)$$

$$\Rightarrow \frac{x(1)^n + x(2)^n}{x(0)^n + x(1)^n} = \frac{x(2)^n + x(3)^n}{x(1)^n + x(2)^n} \quad (6)$$

Hence proved they are in in G.P

$$x(n) = x(0)r^n u(n) \quad (7)$$

$$X(z) = \frac{x(0)}{1 - rz^{-1}}, \quad |z| > |r| \quad (8)$$