NCERT DISCRETE 11.9.5 Q9

EE23BTECH11214 - Harsha Vardhan Kumar*

Question:
The first term of a G.P. is 1. The sum of the third term and fifth term is 90. Find the common ratio of G.P.

Solution:
G.P. in terms of its z-transform:

Symbol	Description	Value
$x(n)$	General term	ar^n
a	First term	1
r	Common ratio	-
$x(2)+x(4)$	Sum of 3rd and 5th terms	90

TABLE I
GIVEN PARAMETERS LIST

$$ar^2 + ar^4 = 90 \tag{1}$$
$$r^2 + r^4 = 90 \tag{2}$$
$$(r^2-9)(r^2+10) = 0 \tag{3}$$
$$r^2 = 9 \tag{4}$$
$$r = \pm 3 \tag{5}$$

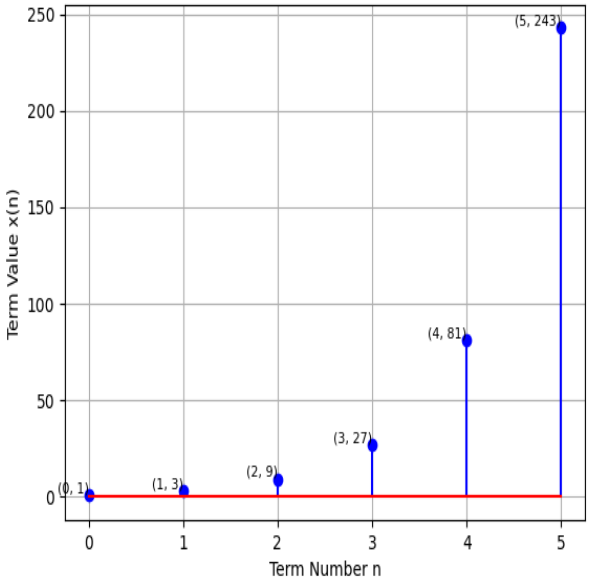

Fig. 1. r = 3

z transform of GP is
Refered from appendix (**??**)
For $r = 3$

$$X(z) = \frac{1}{1-3z^{-1}}, \quad |z| > |3| \tag{6}$$

For $r = -3$

$$X(z) = \frac{1}{1+3z^{-1}}, \quad |z| > |3| \tag{7}$$

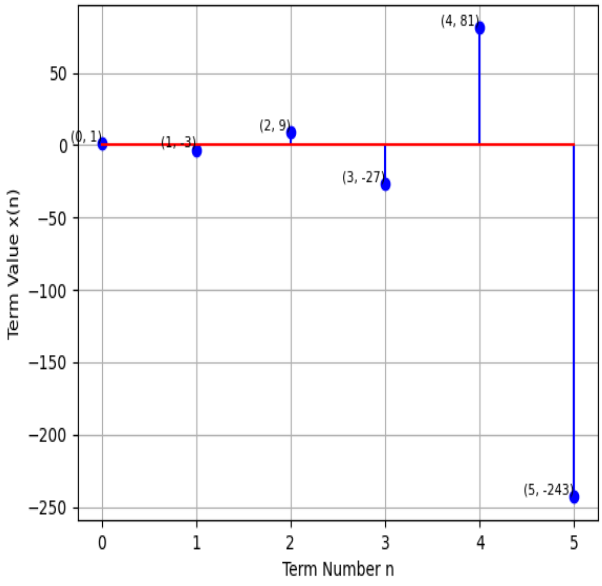

Fig. 2. r = -3