

# DISCRETE 11.9.3 Q-4

EE23BTECH11066 - Yakkala Amarnath Karthik

## Question:

The 4<sup>th</sup> term of a G.P. is square of its second term, and the first term is -3. Determine its 7<sup>th</sup> term, and find the Z transform of the series.

## Solution:

Variable	Description	value
$x(0)$	first term of G.P.	-3
$r$	Common ratio of G.P.	-3
$x(n)$	general term of the G.P.	$ar^n$
-	$x(3)=(x(1))^2$	-

TABLE I

A TABLE WITH INPUT PARAMETERS

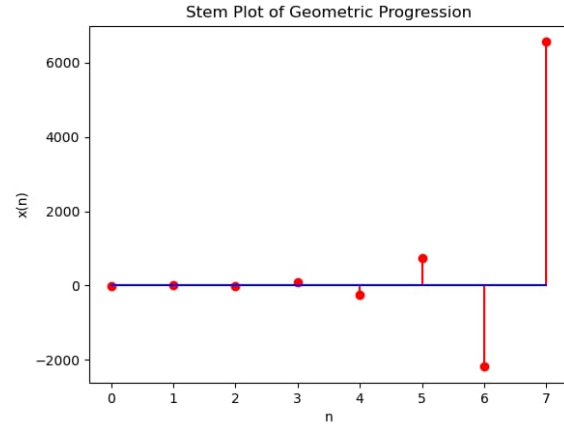


Fig. 1. Graph showing first 8 terms of the GP

$$x(0)r^3 = (x(0)r^1)^2 \quad (1)$$

$$\implies x(0)r^3 = x(0)^2 r^2 \quad (2)$$

$$\implies r = x(0) = -3 \quad (3)$$

general term

$$x(n) = x(0)r^n = (-3)(-3)^n \quad (4)$$

$$x(6) = x(0)r^6 \quad (5)$$

$$= (-3)(-3)^6 \quad (6)$$

$$= (-3)^7 \quad (7)$$

$$= -2187 \quad (8)$$

$$x(6) = -2187 \quad (9)$$

Finding Z transform :

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \quad (10)$$

$$= \sum_{n=-\infty}^{\infty} ar^n u(n) z^{-n} \quad (11)$$

$$= \sum_{n=0}^{\infty} ar^n z^{-n} \quad (12)$$

$$= a(1 + rz^{-1} + r^2 z^{-2} + \dots) \quad (13)$$

$$= \frac{a}{1 - rz^{-1}} \quad (14)$$

$$X(n) = \frac{a}{1 - rz^{-1}} = \frac{-3}{1 + 3z^{-1}} \quad \{ROC : |rz^{-1}| < 1\}$$