

# NCERT 11.9.3.Q10

EE23BTECH11224 - Sri Krishna Prabhas Yadla\*

**Question:** Find the sum to indicated number of terms in the geometric progression  $x^3, x^5, x^7, \dots, n$  terms (if  $x \neq \pm 1$ ).

**Solution:**

Input Parameters	Values	Description
$x(0)$	$x^3$	Initial term
$r$	$x^2$	Common ratio

TABLE 1  
GIVEN INPUTS

$$X(z) = \frac{x(0)}{1 - rz^{-1}} \quad (1)$$

From Table 1,

$$= \frac{x^3}{1 - x^2 z^{-1}} \quad |z| > x^2 \quad (2)$$

$$y(n) = \sum_{k=0}^n x(k) = x(n) * u(n) \quad (3)$$

$$Y(z) = X(z)U(z) \quad (4)$$

$$= \frac{x^3}{(1 - x^2 z^{-1})(1 - z^{-1})} \quad |z| > x^2 \cap |z| > 1 \quad (5)$$

$$= \frac{x^3}{x^2 - 1} \left( \frac{x^2}{1 - x^2 z^{-1}} - \frac{1}{1 - z^{-1}} \right) \quad (6)$$

Since  $u(n) \xleftrightarrow{Z} \frac{1}{1-z^{-1}}$  and  $r^n u(n) \xleftrightarrow{Z} \frac{1}{1-rz^{-1}}$ , inverse of  $Y(z)$  can be expressed as

$$y(n) = x^3 \left( \frac{x^{2n+2} - 1}{x^2 - 1} \right) u(n) \quad (7)$$

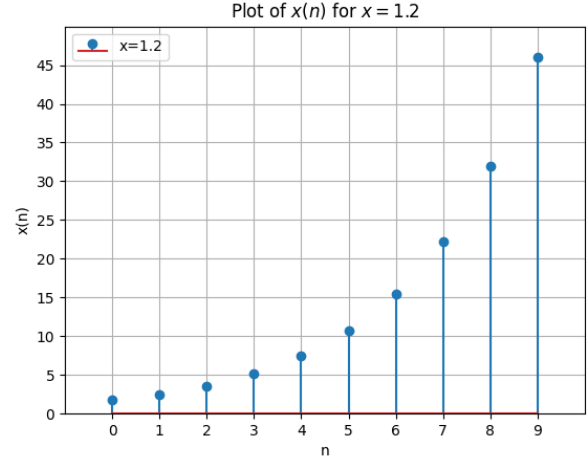


Fig. 1.