

# Discrete Assignment

## EE1205 Signals and Systems

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**Question 11.9.3.8:** Find the sum to indicated number of term in each of the geometric progressions in  $\sqrt{7}, \sqrt{21}, 3\sqrt{7}, \dots, n$  terms

**Solution:**

| variable | value                             | description                                    |
|----------|-----------------------------------|--|
| $x(0)$   | $\sqrt{7}$                        | first term of the geometric progression        |
| $r$      | $\sqrt{3}$                        | common ratio of the geometric progression      |
| $x(n)$   | $\sqrt{7}(3^n)u(n)$               | $n^{th}$ term of the geometric progression     |
| $y(n)$   | $\frac{x(0)(r^{n+1}-1)}{r-1}u(n)$ | Sum of the n term of the geometric progression |

Table : Input parameters

$$X(z) = x(0) \left( \frac{1}{1 - rz^{-1}} \right), \quad |rz^{-1}| < 1 \quad (1)$$

$$y(n) = x(n) * u(n) \quad (2)$$

$$Y(z) = X(z) U(z) \quad (3)$$

$$= \sqrt{7} \left( \frac{1}{1 - \sqrt{3}z^{-1}} \right) \left( \frac{1}{1 - z^{-1}} \right) \quad (4)$$

$$= \left( \frac{\sqrt{7}}{\sqrt{3} - 1} \right) \left( \left( \frac{\sqrt{3}}{1 - \sqrt{3}z^{-1}} \right) - \left( \frac{1}{1 - z^{-1}} \right) \right) \quad (5)$$

$$\frac{1}{1 - rz^{-1}} \xleftrightarrow{\mathcal{Z}^{-1}} r^n u(n), \quad |rz^{-1}| < 1 \quad (6)$$

$$y(n) = \sqrt{7} \left( \frac{\sqrt{3}^{n+1} - 1}{\sqrt{3} - 1} \right) u(n), \quad |\sqrt{3}z^{-1}| < 1 \quad (7)$$

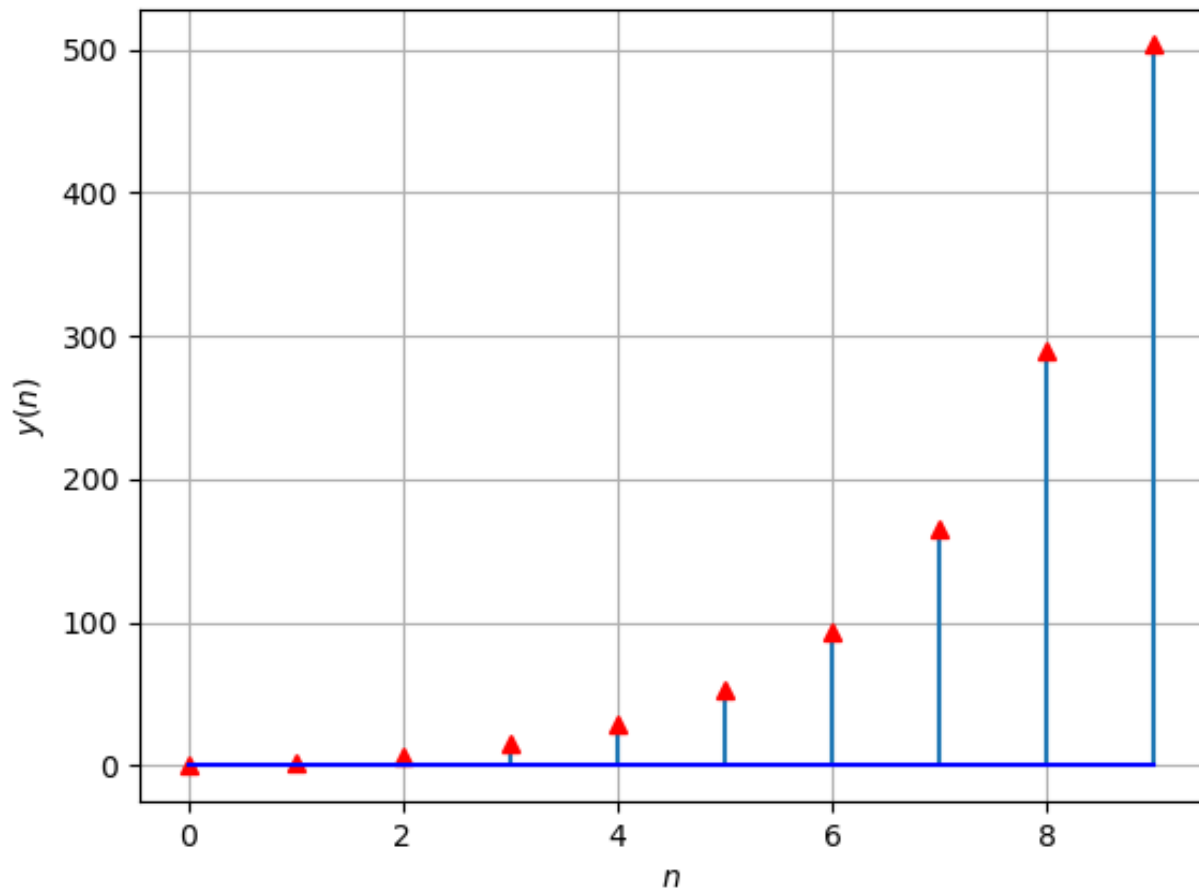


Fig. 0. STEM PLOT OF  $y(n)$