

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: Sum of the geometric progression of $\sqrt{7}, \sqrt{21}, 3\sqrt{7}, \dots, n$ terms is

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

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

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

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

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

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

$$\frac{1}{1 - rz^{-1}} \xleftrightarrow{z^{-1}} r^n u(n) \quad (6)$$

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

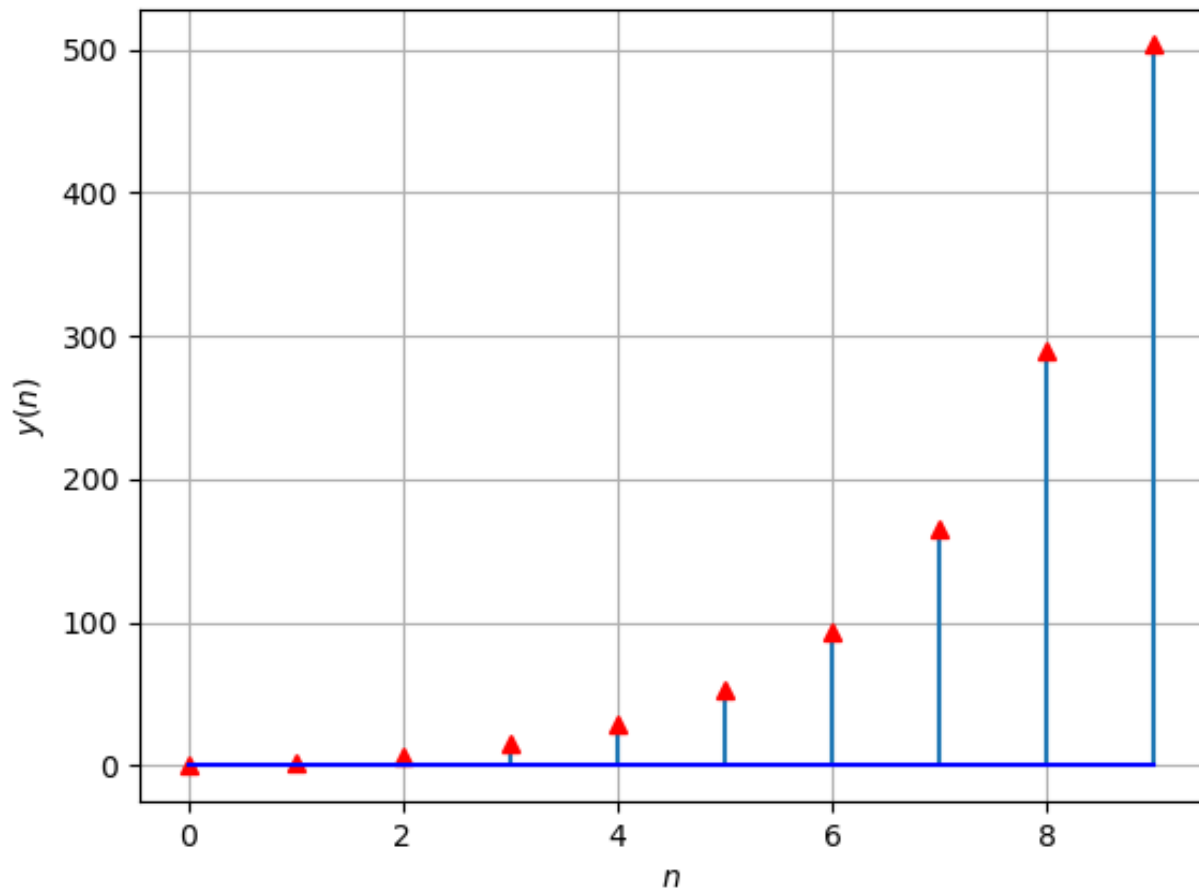


Fig. 0. STEM PLOT OF $y(n)$