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 $\sqrt{7}, \sqrt{21}, 3\sqrt{7}, ...n$ terms

Solution:

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

Table : Input parameters

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

$$y(n) = x(n) * u(n) \tag{2}$$

$$Y(z) = X(z)\,U(z) \tag{3}$$

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

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

$$\frac{1}{1-rz^{-1}} \overset{\mathcal{Z}^{-1}}{\longleftrightarrow} r^n u(n), \quad |z| > r \tag{6}$$

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

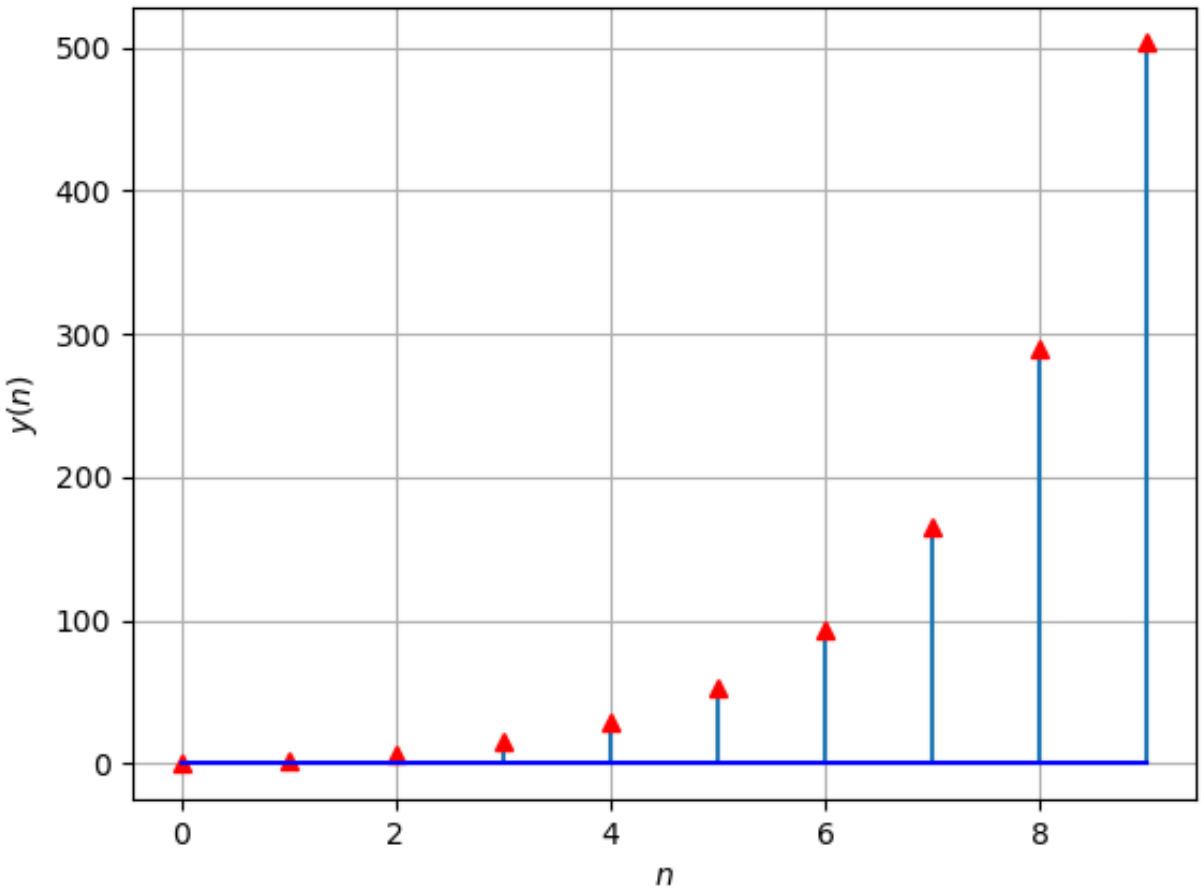

Fig. 0. STEM PLOT OF $y(n)$