Discrete Assignment
EE1205 Signals and Systems

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EE23BTECH11036

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

Input Table:

variable	value	description
x(0)	$\sqrt{7}$	first term of the geometric progession
r	$\sqrt{3}$	common ratio of the geometeric progression
x(n)	$\sqrt{7(3^n)}$	n^{th} term of the geometric progession
n		no of the term in the geometric progression
y(n+1)	$\frac{x(0)(r^{n+1}-1)}{r-1}$	Sum of the n+1 term of the geometric progression
U(z)	$\frac{1}{1-z^{-1}}$ $\quad |z^{-1}| < 1$	z-transformation of u(n)

Z-Transformation:

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

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

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

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

$$u(n) \overset{z}{\leftrightarrow} \left(\frac{1}{1-z^{-1}}\right) \tag{5}$$

$$\left(\sqrt{7}\left(\frac{1}{1 - \sqrt{3}z^{-1}}\right)\right) \overset{z}{\leftrightarrow} \sqrt{7}\left(\frac{\left(\sqrt{3}^{n+1}-1\right)}{\sqrt{3}-1}\right) \tag{6}$$

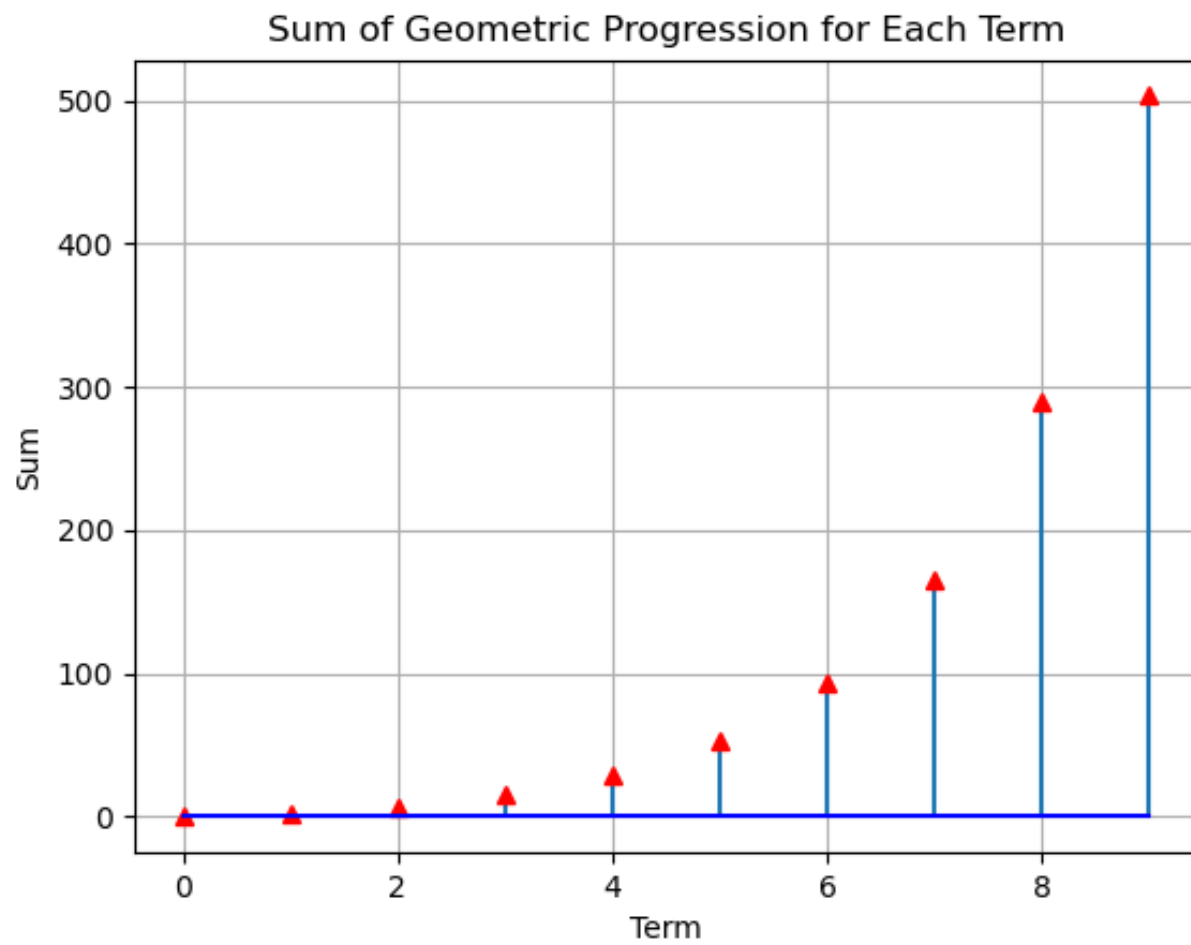$$y(n) = \sqrt{7}\left(\frac{\left(\sqrt{3}^{n+1} - 1\right)}{\sqrt{3} - 1}\right)u(n) \tag{7}$$

Fig. 0. **sum of the geometric progression after adding each term**