

NCERT Discrete - 11.9.3.12

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Question : 11.9.3.12 The sum of the first three terms of a G.P is $39/10$ and their product is 1. Find the common ratio and the terms.

Solution:

Parameter	Value	Description
$x(0)$		First term
r		Common ratio
$x(0)^3 r^3$	1	Product of terms
$x(0) + x(0)r + x(0)r^2$	$\frac{39}{10}$	Sum of terms

TABLE 0
INPUT PARAMETERS

$$y(n) = x(0) \left(\frac{r^{n+1} - 1}{r - 1} \right) u(n) \quad (1)$$

From Table 0 and (1) :

$$y(2) = x(0) \left(\frac{r^3 - 1}{r - 1} \right) \quad (2)$$

$$\frac{39}{10} = x(0) (r^2 + r + 1) \quad (3)$$

$$\Rightarrow \frac{39r}{10} = r^2 + r + 1 \quad (\because x(0)r = 1) \quad (4)$$

$$\Rightarrow (2r - 5)(5r - 2) = 0 \quad (5)$$

$$\Rightarrow r = \frac{2}{5} \quad \text{or} \quad \frac{5}{2} \quad (6)$$

1) If $r = \frac{2}{5}$, then terms are $\frac{5}{2}$, 1, $\frac{2}{5}$.

2) If $r = \frac{5}{2}$, then terms are $\frac{2}{5}$, 1, $\frac{5}{2}$.

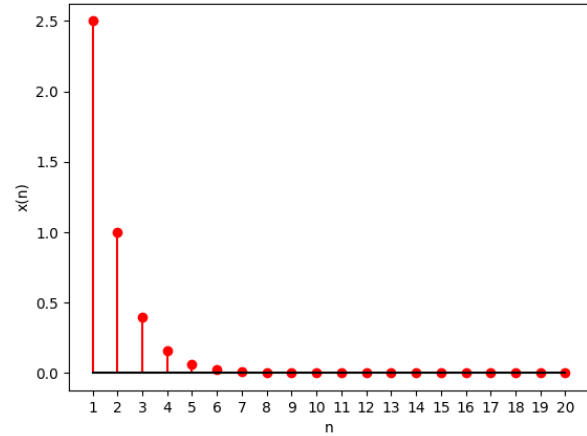


Fig. 2. stem plots of GP if $r = \frac{2}{5}$

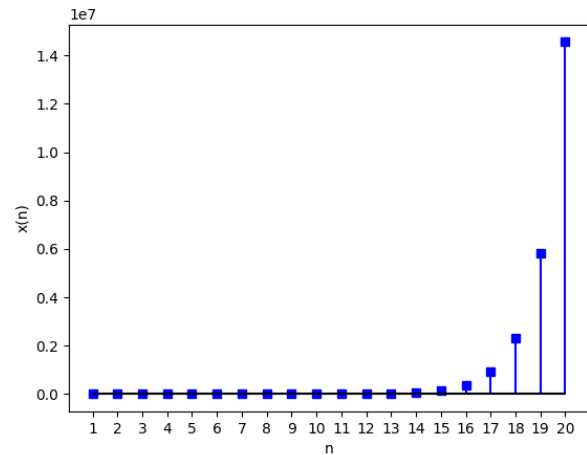


Fig. 2. stem plots of GP if $r = \frac{5}{2}$