

EE23BTECH11024 - G.Karthik Yadav*

11.9.5.14

1. Let S be the sum, P the product and R the sum of reciprocals of n terms in a G.P. Prove that $P^2 R^n = S^n$.

Solution:

from table I

Symbol	Parameters
$u(n)$	unit step function
r	common ratio of GP
$x(n)$	general term in a GP
$y(n)$	general term of reciprocal terms in a GP

TABLE I
INPUT PARAMETERS

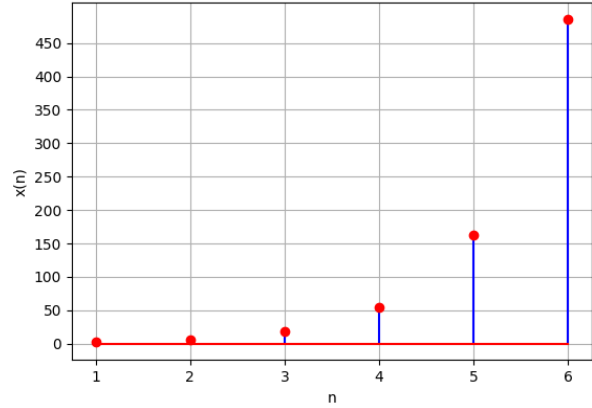


Fig. 1. Stem Plot of $x(n) = (2)3^n$, $x(0) = 2$ and $r = 3$

$$x(n) = x(0) r^n \quad (1)$$

Using (??),

$$S = x(0) \left(\frac{r^{n+1} - 1}{r - 1} \right) u(n) \quad (2)$$

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

Using (??) and setting the first term as $\frac{1}{x(0)}$ and common ratio as r^{-1} ,

$$R = \frac{1}{x(0)} \left(\frac{1 - r^{-(n+1)}}{1 - r^{-1}} \right) \quad (4)$$

$$P = (x(0))^{n+1} r^{n(n+1)} \quad (5)$$

by using eq (2), eq (4) and eq (5)
 $P^2 R^n = S^n$.

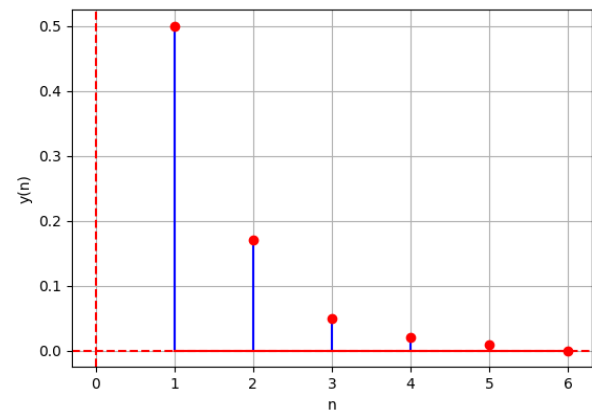


Fig. 2. Stem Plot of $y(n) = (0.5)3^{-n}$, $x(0) = 2$ and $r = 3$