11.9.3.3

EE23BTECH11065 - prem sagar

Question:
The 5th,8th and 11th terms of a GP are p,q and s respectively .show that

$$q^2 = ps$$

solution:
first term of a GP= x(0)
common ratio of GP=r

Fig. 0. plot x(n) vs n

$$x(n) = x(0)\,r^n, \text{if } n \geq 0 \quad (1)$$
$$x(5) = x(0)\,r^5 \quad (2)$$
$$x(8) = x(0)\,r^8 \quad (3)$$
$$x(11) = x(0)\,r^{11} \quad (4)$$
$$x(8)\,x(8) = x(0)\,r^8\,x(0)\,r^8 \quad (5)$$
$$= x(0)^2\,r^{16} \quad (6)$$
$$x(5)\,x(11) = x(0)\,r^5\,x(0)\,r^{11} \quad (7)$$
$$= x(0)^2\,r^{16} \quad (8)$$
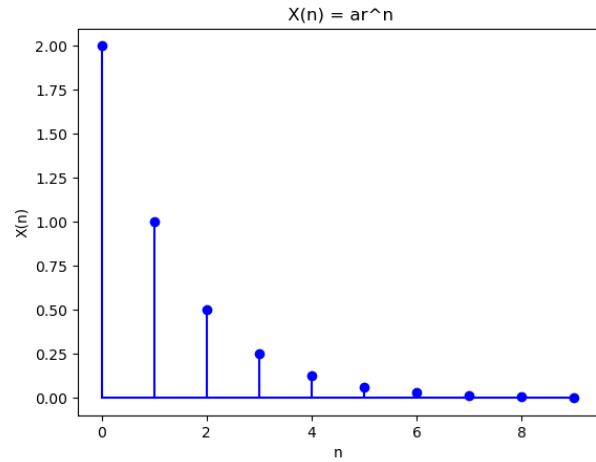$$x(8)^2 = x(5)\,x(11) \quad (9)$$
$$q^2 = ps \quad (10)$$

$$x(n) \xoverset{Z}{\longleftrightarrow} X(Z) \quad (12)$$

$$X(Z) = \sum_{n=-\infty}^{\infty} x(n)Z^{-n} \quad (13)$$

$$= \frac{x(0)}{1 - r\,z^{-1}} \;, |z| > |r| \quad (14)$$

symbol	value	description
$x(5)$	p	5th term of GP
$x(8)$	q	8th term of GP
$x(11)$	s	11th term of GP

$$u(n) = \begin{cases} 1, & \text{if } n \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

$$x(n) = x(0)\,r^n\,u(n) \quad (11)$$

from (10)

$$x(n) = \begin{cases} x(0)\,r^n & \text{if } n \geq 0 \\ 0, & \text{otherwise} \end{cases}$$