Assignment-2

EE:1205 (*SignalsSystems*)
Indian Institute of Technology, Hyderabad

Md Ayaan Ashraf
EE23BTECH11041

Question 11.9.3.22

If the first and the nth term of a G.P. are a and b, respectively, and if P is the product of n terms , prove that $P^2 = (ab)^n$

Solution:

Parameter	Value	Description
$x(0)$	a	First Term
r	?	Common Ratio
$x(n)$	b	n^{th} term
P	?	Product of n terms

TABLE 0
PARAMETER TABLE 11.9.3.22

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$$r = \frac{x(1)}{x(0)} \tag{1}$$

$$x(n) = x(0)\, r^n\, (u(n)) \tag{2}$$

$$(x(0)\, x(n))^n = (x(0))^{2n}\, r^{n^2} = (ab)^n \tag{3}$$

$$P = \prod_{k=0}^{n} x(0)\, r^k = (x(0))^n\, r^{\frac{n^2}{2}} \tag{4}$$

$$P^2 = (x(0))^{2n}\, r^{n^2} \tag{5}$$

$$\implies P^2 = (ab)^n \tag{6}$$

(7)

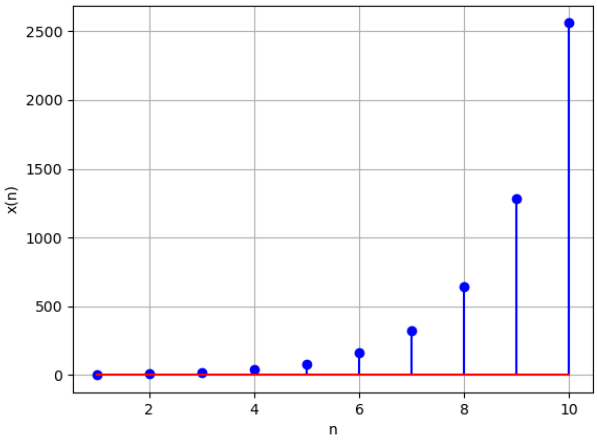

Fig. 0. (x(0)=5, r=2) Plot of x(n)= (5) $(2)^n$

Z-transform of x(n):

$$X(z) = \frac{x(0)}{1 - rz^{-1}}, \quad |z| > r \tag{8}$$