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	Description
$x(0)$	First Term
r	Common Ratio
$x(n)$	n^{th} term

TABLE 0
PARAMETER TABLE 11.9.3.22

$$x(n) = x(0)r^n(u(n)) \tag{1}$$

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

$$P = \prod_{k=0}^{n} x(0)r^k = x(0)^n r^{\frac{n^2}{2}} \tag{3}$$

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

From (2) and (4) , $P^2 = (x(0)x(n))^n$

Z-transform of x(n):

$$X(z) = \frac{x(0)}{1 - rz^{-1}}, \quad |z| > r \tag{5}$$

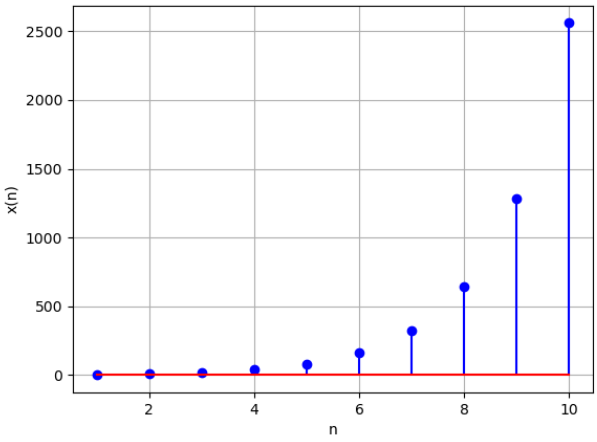

Fig. 0. Plot of x(n)= $(5)(2)^n$