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**Question 11.9.3-19:** Find the sum of the products of the corresponding terms of the sequences 2, 4, 8, 16, 32 and 128, 32, 8, 2,  $\frac{1}{2}$ .

**Solution:**

TABLE I: Input Parameters

Parameter	Value	Description
$x_1(n)$	2, 4, 8, 16, 32	Sequence 1
$x_2(n)$	128, 32, 8, 2, $\frac{1}{2}$	Sequence 2
$y(n)$	-	Sum of the Products

Define the sequences as follows:

$$\text{Sequence 1: } x_1(n) = 2(2^n)u(n) \quad (1)$$

$$\text{Sequence 2: } x_2(n) = 128\left(\frac{1}{4}\right)^n u(n) \quad (2)$$

$$x(n) = x_1(n)x_2(n) \quad (3)$$

$$x(n) = \left(\frac{256}{2^n}\right)u(n) \quad (4)$$

**Z-Transform:** The Z-transform of a sequence  $x(n)$  is:

$$X(z) = \frac{512}{2 - z^{-1}} \quad |z| > \frac{1}{2} \quad (5)$$

$$\text{Let, } y(n) = x(n) * u(n) \quad (6)$$

$$Y(z) = X(z)U(z) \quad (7)$$

$$= \left(\frac{512}{2 - z^{-1}}\right)\left(\frac{1}{1 - z^{-1}}\right) \quad (8)$$

$$= \frac{-256}{1 - \frac{z^{-1}}{2}} + \frac{512}{1 - z^{-1}} \quad (9)$$

**Inverse of Z Transform of Y(z):**

$$y(n) = \left[\frac{-256}{2^n} + \frac{512}{1}\right]u(n) \quad (10)$$

As,  $n = 4$ , sum = 496.

This gives us the sum of the products of corresponding terms, which is 496.

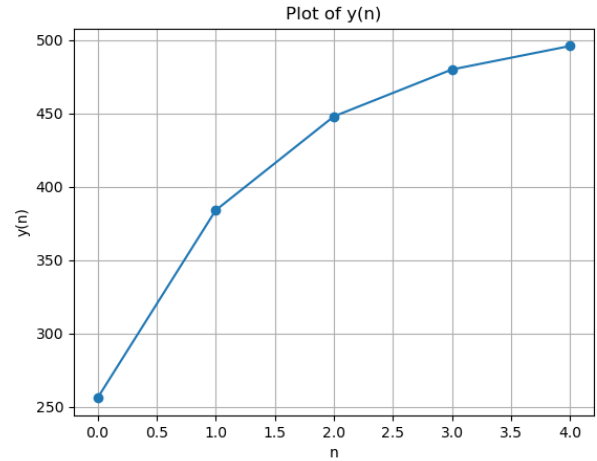


Fig. 1: Plot of  $y(n)$  vs  $n$