

EE23BTECH11217 - Prajwal M*

EXERCISE 9.1

12 Write the five terms at $n = 1, 2, 3, 4, 5$ of the sequence and obtain the Z-transform of the series

$$x(n) = -1, \quad n = 0 \quad (1)$$

$$= \frac{x(n-1)}{n}, \quad n > 0 \quad (2)$$

$$= 0, \quad n < 0 \quad (3)$$

Solution:

$$x(1) = \frac{x(0)}{1} = -1 \quad (4)$$

$$x(2) = \frac{x(1)}{2} = -\frac{1}{2} \quad (5)$$

$$x(3) = \frac{x(2)}{3} = -\frac{1}{(2)(3)} = -\frac{1}{6} \quad (6)$$

$$x(4) = \frac{x(3)}{4} = -\frac{1}{(2)(3)(4)} = -\frac{1}{24} \quad (7)$$

$$x(5) = \frac{x(4)}{5} = -\frac{1}{(2)(3)(4)(5)} = -\frac{1}{120} \quad (8)$$

$$x(n) = \frac{-1}{n!} (u(n)) \quad (9)$$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n} \quad (11)$$

using (9),

$$= \sum_{n=-\infty}^{\infty} \frac{-1}{n!} u(n) z^{-n} \quad (12)$$

$$= \sum_{n=0}^{\infty} \frac{-1}{n!} z^{-n} \quad (13)$$

$$= -e^{z^{-1}} \quad \{z \in \mathbb{C} : z \neq 0\} \quad (14)$$

Symbol	Value	Description
$x(n)$	$\frac{-1}{n!}$	general term of the series
$X(z)$	$-e^{z^{-1}}$	Z-transform of $x(n)$
$u(n)$		unit step function

TABLE I
PARAMETERS

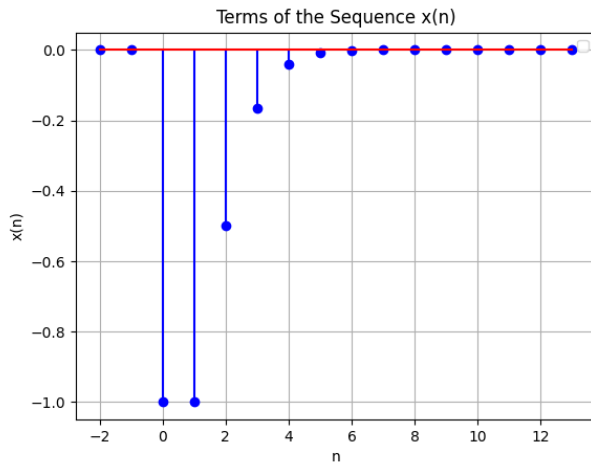


Fig. 1. Plot of $x(n)$ vs n

$$x(n) \xleftrightarrow{Z} X(z) \quad (10)$$