NCERT Discrete

Pragnidhved Reddy
EE23BTECH11050

Question 10.5.2.8:
An AP consists of 50 terms of which 3^{rd} term is 12 and the last term is 106. Find the 29^{th} term.
Solution :

Parameter	Value	description
$x(3)$	12	Third term
$x(50)$	106	Last term
$x(0)$	?	Zeroth term
d	?	Common difference
$x(n)$	$[x(0)+nd]u(n)$	general term

TABLE I
INPUT PARAMETERS

$$x(3) = x(0) + 3d \tag{1}$$
$$x(50) = x(0) + 50d \tag{2}$$

By solving (1) and (2), we get

$$\implies d = 2 \tag{3}$$
$$\implies x(0) = 6 \tag{4}$$

From the table

$$x(n) = [x(0) + nd]u(t) \tag{5}$$
$$\implies x(n) = (6 + 2n)u(t) \tag{6}$$
$$\tag{7}$$

Finding x(29)

$$x(29) = x(0) + 29(2) \tag{8}$$
$$\implies x(29) = 64 \tag{9}$$

Finding the Z-transform

$$X(z) = \sum_{k=-\infty}^{\infty} x(n) \times u(t) \times z^{-n} \tag{10}$$
$$\implies X(z) = \sum_{k=0}^{\infty} x(n) \times z^{-n} \tag{11}$$
$$\implies X(z) = \frac{6 - 8z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \tag{12}$$

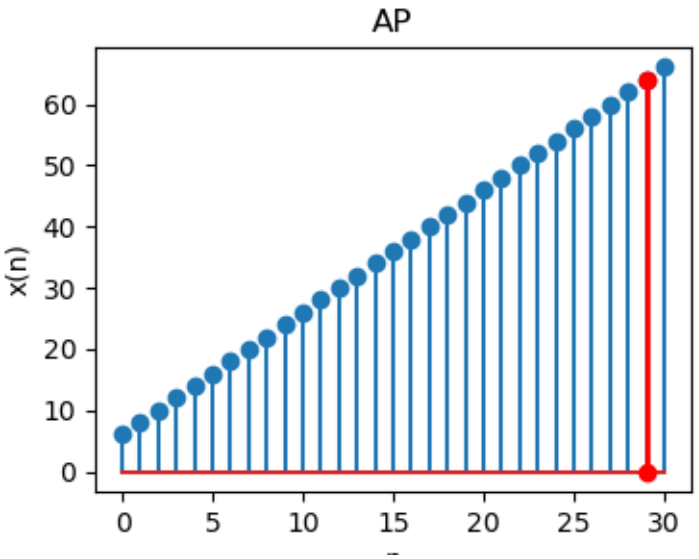

Fig. 1. graph of the given AP