

10.05.2

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QUESTION:

1. In the following APs, find the missing terms in the boxes:

(i) $2, \square, 26$

(ii) $\square, 13, \square, 3$

(iii) $5, \square, \square, 9\frac{1}{2}$

(iv) $-4', \square, \square, \square, \square, 6$

(v) $\square, 38, \square, \square, \square, -22'$

Solution:

n	$x_1(n)$	$x_2(n)$	$x_3(n)$	$x_4(n)$	$x_5(n)$
0	2	18	5	-4	53
1	14	13	$6\frac{1}{2}$	-2	38
2	26	8	8	0	23
3	38	3	$9\frac{1}{2}$	2	8
4	50	-2	11	4	-7
5	62	-7	$12\frac{1}{2}$	6	-22

TABLE I

FIRST THREE TERMS OF AP SERIES

(i) $a_1=2, a_3=26, a_3=a+2d$

$$26 = 2 + 2d \quad (1)$$

$$24 = 2d \quad (2)$$

$$\therefore d = 12 \quad (3)$$

$$a_2 = 14 \quad (4)$$

(ii) $a_2 = 13, a_4 = 3, a_2 = a + d, a_4 = a + 3d$

$$3 - 13 = 2d \quad (5)$$

$$-10 = 2d \quad (6)$$

$$\therefore d = -5 \quad (7)$$

$$a_1 = 18 \quad (8)$$

$$a_3 = 8 \quad (9)$$

(iii) $a_1=5, a_4=9\frac{1}{2}, a_4 = a + 3d$

$$9\frac{1}{2} = 5 + 3d \quad (10)$$

$$3d = 4\frac{1}{2} \quad (11)$$

$$\therefore d = 1\frac{1}{2} \quad (12)$$

$$a_2 = 6\frac{1}{2} \quad (13)$$

$$a_3 = 8 \quad (14)$$

(iv) $a_1=-4, a_6=6, a_6=a+5d$

$$6 = -4 + 5d \quad (15)$$

$$10 = 5d \quad (16)$$

$$\therefore d = 2 \quad (17)$$

$$a_2 = -2 \quad (18)$$

$$a_3 = 0 \quad (19)$$

$$a_4 = 2 \quad (20)$$

$$a_5 = 4 \quad (21)$$

(v) $a_2=38, a_6=-22$

$$-22 - 38 = 4d \quad (22)$$

$$-60 = 4d \quad (23)$$

$$\therefore d = -15 \quad (24)$$

$$a_1 = 53 \quad (25)$$

$$a_3 = 23 \quad (26)$$

$$a_4 = 8 \quad (27)$$

$$a_5 = -7 \quad (28)$$

$$(29)$$

1) The Z-transform of $x(n) = 2 + 12n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \quad (30)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (2 + 12n)u(n)z^{-n} \quad (31)$$

$$X(z) = 2 \frac{1}{1 - z^{-1}} + 12 \frac{z^{-1}}{(1 - z^{-1})^2} \quad (32)$$

$$X(z) = \frac{2 + 10z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (33)$$

$$(34)$$

2) The Z-transform of $x(n) = 18 - 5n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \quad (35)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (18 - 5n)u(n)z^{-n} \quad (36)$$

$$X(z) = 18 \times \frac{1}{1 - z^{-1}} - 5 \frac{z^{-1}}{(1 - z^{-1})^2} \quad (37)$$

$$X(z) = \frac{18 - 23z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (38)$$

$$(39)$$

3) Z-transform of $x(n) = 5 + \frac{3}{2}n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \quad (40)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (5 + \frac{3}{2}n)u(n)z^{-n} \quad (41)$$

$$X(z) = 5 \times \frac{1}{1 - z^{-1}} + \frac{3}{2} \frac{z^{-1}}{(1 - z^{-1})^2} \quad (42)$$

$$X(z) = \frac{5 - \frac{7}{2}z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (43)$$

$$(44)$$

4) Z-transform of $x(n) = -4 + 2n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \quad (45)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (-4 + 2n)u(n)z^{-n} \quad (46)$$

$$X(z) = -4 \times \frac{1}{1 - z^{-1}} + 2 \frac{z^{-1}}{(1 - z^{-1})^2} \quad (47)$$

$$X(z) = \frac{-4 + 6z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (48)$$

$$(49)$$

5) Z-transform of $x(n) = 53 - 15n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \quad (50)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (53 - 15n)u(n)z^{-n} \quad (51)$$

$$X(z) = 53 \times \frac{1}{1 - z^{-1}} - 15 \frac{z^{-1}}{(1 - z^{-1})^2} \quad (52)$$

$$X(z) = \frac{53 - 68z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (53)$$

$$(54)$$

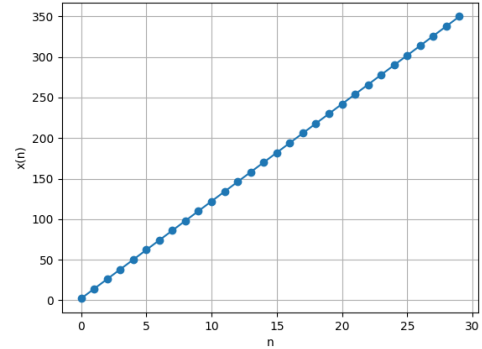


Fig. 1.

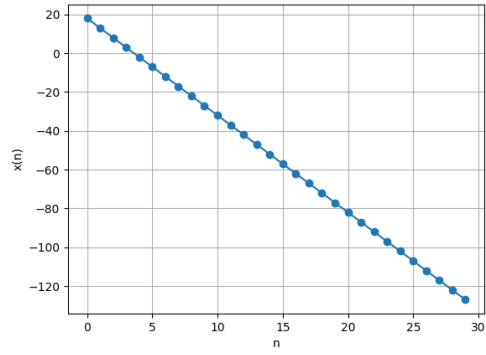


Fig. 2.

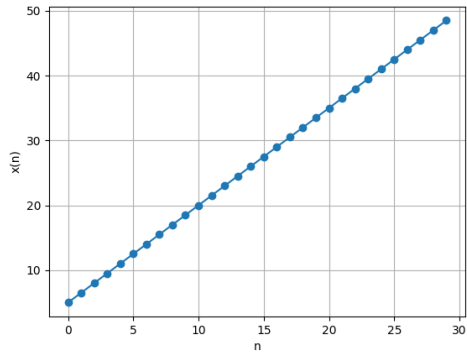


Fig. 3.

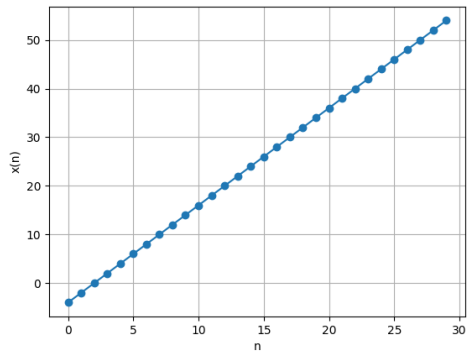


Fig. 4.

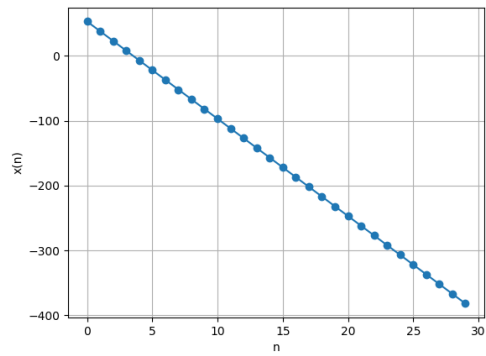


Fig. 5.