

Assignment

EE23BTECH11008 - Meenakshi

Q:The difference between any two cosecutive interior angles of a polygon is 5° .If the smallest angle is 120° ,find the number of sides of polygon.

Solution:

| Variable | Description | Value |
|----------|-------------------------|-------|
| $x(0)$ | first term of AP | 120 |
| d | common difference of AP | 5 |
| $x(n)$ | general term of AP | none |

TABLE 0: input parameters

Sum of interior angles of a polygon with $n + 1$ sides is given by

$$S = (n - 1)180 \quad (1)$$

Sum of n terms of AP is given by

$$y(n) = \sum_{k=0}^n x(k) \quad (2)$$

$$= x(n) * u(n) \quad (3)$$

where $x(n) = 120 + 5n$

$$x(n) * u(n) = (n - 1)180 \quad (4)$$

$$Y(z) = X(z)U(z) \quad (5)$$

$$= \left(\frac{x(0)}{1 - z^{-1}} + \frac{dz^{-1}}{(1 - z^{-1})^2} \right) \cdot \frac{1}{1 - z^{-1}} \quad |z| > 1 \quad (6)$$

$$= \frac{120}{(1 - z^{-1})^2} + \frac{5z^{-1}}{(1 - z^{-1})^3} \quad |z| > 1 \quad (7)$$

$$(8)$$

$$\left(\frac{1}{(1 - z^{-1})^2} \right) \xrightarrow{Z^{-1}} (n + 1)u(n) \quad |z| > 1 \quad (9)$$

$$\left(\frac{z^{-1}}{(1 - z^{-1})^3} \right) \xrightarrow{Z^{-1}} \frac{(n)(n - 1)}{2}u(n - 1) \quad |z| > 1 \quad (10)$$

applying inverse Z-transform for each term and solving we get,

$$(11)$$

$$y(n) = \frac{n + 1}{2} (240 + 5n) u(n) \quad (12)$$

now from (4)

$$y(n) = (n - 1)180 \frac{n + 1}{2} (240 + 5n) u(n) = (n - 1)180 \quad (13)$$

$$(14)$$

now replace n by $n - 1$:

$$n(235 + 5n) = (n - 2)360 \quad (15)$$

$$5n^2 - 125n + 720 = 0 \quad (16)$$

$$n = 16, 9 \quad (17)$$

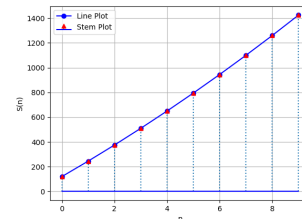


Fig. 0: Plot of the sum of n terms taken from Python