

1.1.6.9

EE24BTECH11030 - J.KEDARANANDA

Question:

If three points $(h, 0)$, (a, b) and $(0, k)$ lie on a line, show that

$$\frac{a}{h} + \frac{b}{k} = 1$$

Solution:

Variable	Description	Formula
$\begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$	x,y coordinate of P respectively	$\frac{k(\mathbf{B})+(\mathbf{A})}{k+1}$
$\begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$	x,y coordinate of Q respectively	$\frac{k(\mathbf{B})+(\mathbf{A})}{k+1}$
$\begin{pmatrix} 2 \\ -2 \end{pmatrix}$	x,y coordinate of A respectively	
$\begin{pmatrix} -7 \\ 4 \end{pmatrix}$	x,y coordinate of B respectively	

TABLE 0: Variables Used

As given points lie on same line its determinant value should be equal to 0.

$$\begin{vmatrix} h & 0 & 1 \\ a & b & 1 \\ 0 & k & 1 \end{vmatrix} = 0 \quad (0.1)$$

expanding the det by column 3.

$$1 \begin{vmatrix} h & 0 \\ a & b \end{vmatrix} - 1 \begin{vmatrix} h & 0 \\ 0 & k \end{vmatrix} + 1 \begin{vmatrix} a & b \\ 0 & k \end{vmatrix} = 0 \quad (0.2)$$

$$hb - hk + ak = 0 \quad (0.3)$$

$$\frac{hb}{hk} - \frac{hk}{hk} + \frac{ak}{hk} = 0 \quad (0.4)$$

$$\frac{b}{k} + \frac{a}{h} = 1 \quad (0.5)$$

$$(0.6)$$

EXAMPLE

lets take 3 points as an example and check whether they follow our line equation or not

(2,0)(1,2)(0,4)

$$\frac{a}{h} + \frac{b}{k} = 1 \quad (0.7)$$

$$\frac{1}{2} + \frac{2}{4} = 1 \quad (0.8)$$

$$(0.9)$$

these points satisfy our line equation

Showing that A,B,C are collinear

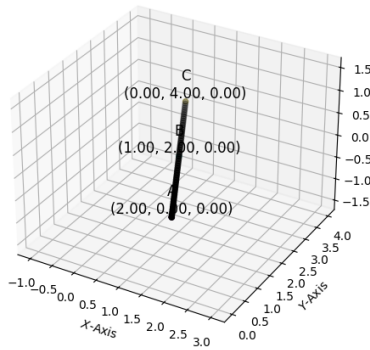


Fig. 0.1: Stem Plot of $y(n)$