

1.1.6-21

EE24BTECH11028 - Jadhav Rajesh

Question: Show that points $A(a, b + c)$, $B(b, c + a)$, $C(c, a + b)$ are collinear.

Solution: let the coordinates of the points be

$A(a, b + c)$

$B(b, c + a)$

$C(c, a + b)$

we can set up the matrix as follows

$$\Delta = \begin{pmatrix} a & b + c & 1 \\ b & c + a & 1 \\ c & a + b & 1 \end{pmatrix} \quad (0.1)$$

using row operation

$$R_2 \rightarrow R_2 - R_1 \quad (0.2)$$

$$R_3 \rightarrow R_3 - R_1 \quad (0.3)$$

$$\begin{pmatrix} a & b + c & 1 \\ b & (c + b) - (b + c) & 1 - 1 \\ c & (a + b) - (b + c) & 1 - 1 \end{pmatrix} \quad (0.4)$$

$$\begin{pmatrix} a & b + c & 1 \\ b - a & a - b & 0 \\ c - a & a - c & 0 \end{pmatrix} \quad (0.5)$$

expanding along the column third

$$\begin{pmatrix} b - a & a - b \\ c - a & a - c \end{pmatrix} \quad (0.6)$$

by using column operation

$$C_1 \rightarrow C_1 + C_2 \quad (0.7)$$

$$\begin{pmatrix} 0 & a - b \\ 0 & a - c \end{pmatrix} \quad (0.8)$$

the above process is known as column reduced matrix is defined as the rank.

Define the coordinates of point A, B,, and C

$$a, b, c = 1, 2, 3 \quad (0.9)$$

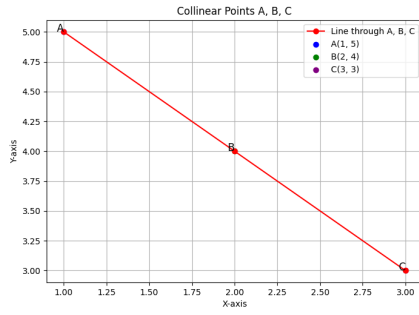


Fig. 0.1: **ABCC**ollinear points