1.7.2

EE24BTECH11001 - Aditya Tripathy

Question:
Show that the points $P\left(5,4\right), Q\left(7,k\right)$ and $R\left(9-2\right)$ are collinear.
Solution:
From (1.1.9.1), Points A, B, C are defined to be collinear if

$$rank\begin{pmatrix}\left(\mathbf{B}-\mathbf{A}\right)^{\top}\\\left(\mathbf{C}-\mathbf{A}\right)^{\top}\end{pmatrix}=1 \tag{0.1}$$

(0.2)

Therefore, there should be only 1 non-zero row in collinearity matrix after row-operations. So, forming the collinearity matrix and doing row operations,

$$\begin{pmatrix}2 & k-4\\4 & -6\end{pmatrix}\xrightarrow{R_2=R_2-2R_1}\begin{pmatrix}2 & k-4\\0 & 2-2k\end{pmatrix} \tag{0.3}$$

$$\implies 2-2k=0 \implies k=1 \tag{0.4}$$

Therefore k=1 will satisfy condition of collinearity.

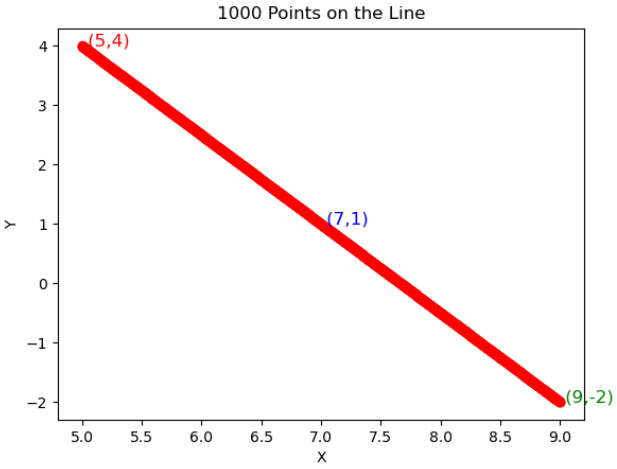

Fig. 0.1: Line joining the three given points