1.4.6

EE24BTECH11058 - P.Shiny Diavajna

Question: If the point $\mathbf{P}\begin{pmatrix}2 & 1\end{pmatrix}$ lies on the line segment joining points $\mathbf{A}\begin{pmatrix}4 & 2\end{pmatrix}$ and $\mathbf{B}\begin{pmatrix}8 & 4\end{pmatrix}$, then

Solution:

Variable	Description
$\mathbf{P}\begin{pmatrix}2 & 1\end{pmatrix}$	Point on the linesegment joining **A** and **B**
$\mathbf{A}\begin{pmatrix}4 & 2\end{pmatrix}$	one end of the linesegment AB
$\mathbf{B}\begin{pmatrix}8 & 4\end{pmatrix}$	another end of the linesegment AB

TABLE 0: Variables Used

$$\|A-B\| = \sqrt{(A-B)^\top (A-B)}$$

$$\mathbf{A} = \begin{pmatrix}4\\2\end{pmatrix} \mathbf{B} = \begin{pmatrix}8\\4\end{pmatrix}$$

$$(A-B) = \begin{pmatrix}-4\\-2\end{pmatrix}$$

$$(A-B)^\top = \begin{pmatrix}-4 & -2\end{pmatrix}$$

$$AB = \sqrt{\begin{pmatrix}-4 & -2\end{pmatrix}\begin{pmatrix}-4\\-2\end{pmatrix}}$$

$$= 2\sqrt{5}$$

Similarly,

$$AP = \sqrt{\begin{pmatrix}-2-1\end{pmatrix}\begin{pmatrix}-2\\-1\end{pmatrix}}$$
$$= \sqrt{5}$$
$$PB = \sqrt{\begin{pmatrix}-6-3\end{pmatrix}\begin{pmatrix}-6\\-3\end{pmatrix}}$$
$$= 3\sqrt{5}$$

Therefore,

$$AP = \frac{1}{2}AB$$

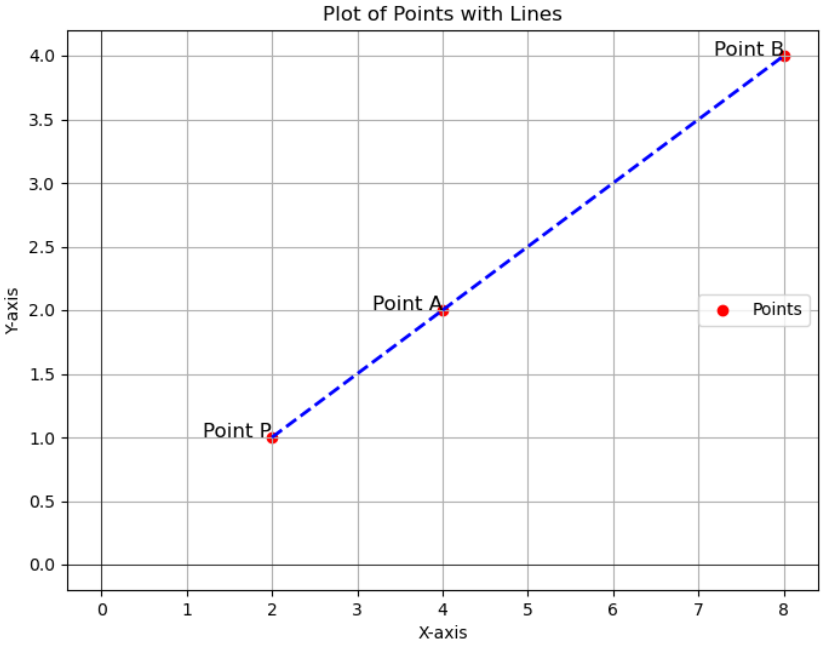

Fig. 0.1: Plot of Points A, B and P