Question: 12.10.4.12

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1 Problem

Find the equation of line passing through the points $\begin{pmatrix}-1\\1\end{pmatrix}$ and $\begin{pmatrix}2\\-4\end{pmatrix}$

2 Solution

$$\mathbf{A} = \begin{pmatrix}-1\\1\end{pmatrix} \quad \mathbf{B} = \begin{pmatrix}2\\-4\end{pmatrix} \tag{2.0.1}$$

Direction vector,

$$\mathbf{m} = \mathbf{A} - \mathbf{B} \tag{2.0.2}$$

$$= \begin{pmatrix}-3\\5\end{pmatrix} \tag{2.0.3}$$

Normal vector,

$$\mathbf{n} = \begin{pmatrix}5\\3\end{pmatrix} \tag{2.0.4}$$

Equation of line is,

$$\mathbf{n}^{\top}\left(\mathbf{x} - \mathbf{x}_0\right) = 0 \tag{2.0.5}$$

$$\begin{pmatrix}5 & 3\end{pmatrix}\left(\mathbf{x} - \begin{pmatrix}-1\\1\end{pmatrix}\right) = 0 \tag{2.0.6}$$

$$\begin{pmatrix}5 & 3\end{pmatrix}\mathbf{x} - \begin{pmatrix}5 & 3\end{pmatrix}\begin{pmatrix}-1\\1\end{pmatrix} = 0 \tag{2.0.7}$$

$$\begin{pmatrix}5 & 3\end{pmatrix}\mathbf{x} + 2 = 0 \tag{2.0.8}$$

$$\begin{pmatrix}5 & 3\end{pmatrix}\mathbf{x} = -2 \tag{2.0.9}$$

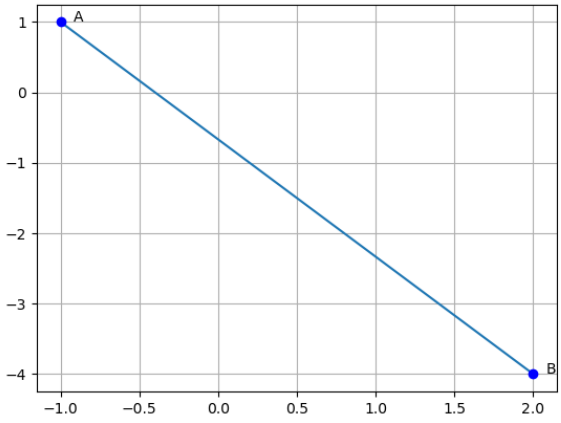

Fig. 0: Line joing points A and B