1.9.18

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QuestionFind the value of x if the distance between the points $\mathbf{A}\,(0,0)$ and $\mathbf{B}\,(x,-4)$ is 5 units.

Solution: Given details:

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} x \\ -4 \end{pmatrix} \tag{2}$$

$$\|AB\| = 5 \tag{3}$$

Distance between 2 vectors **A** and **B** can be represented as:

$$\|AB\| = \sqrt{(\mathbf{B}-\mathbf{A})^T\,(\mathbf{B}-\mathbf{A})} \tag{4}$$

By substituting values:

$$\|AB\| = \sqrt{\begin{pmatrix} x & -4 \end{pmatrix}\begin{pmatrix} x \\ -4 \end{pmatrix}} = \sqrt{x^2 + (-4)^2} = \sqrt{x^2+16} \tag{5}$$

Now comparing it with the given distance:

$$\sqrt{x^2+16} = 5 \tag{6}$$

Square on both sides

$$x^2 + 16 = 25 \tag{7}$$

$$x^2 = 9 \tag{8}$$

$$x = 3 \; or \; x = -3 \tag{9}$$

Final answer:
The values of x are 3 and -3

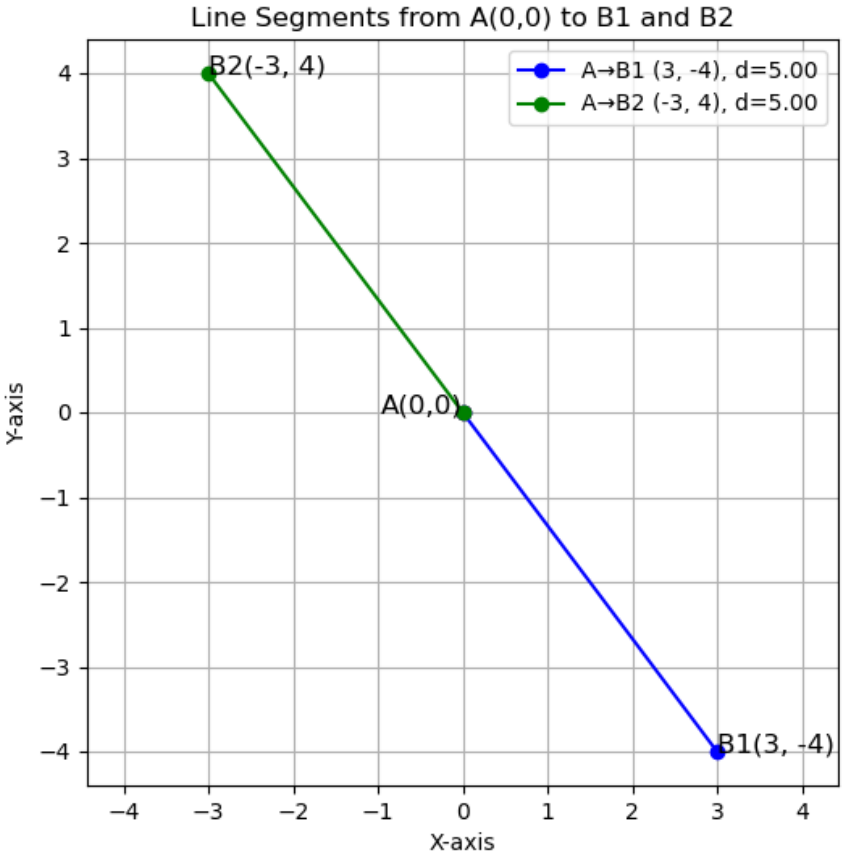

Fig. 0. distance between two points