ASSIGNMENT 6

Y.Nagarani

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1 QUESTION No 2.5

In $\triangle ABC$, $A = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$, $B = \begin{pmatrix} -1 \\ 0 \\ 0 \end{pmatrix}$, $C = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$. Find $\angle B$.

2 SOLUTION

Let,$\mathbf{A} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} -1 \\ 0 \\ 0 \end{pmatrix}$, $\mathbf{C} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$.

Now ,

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix} 2 \\ 2 \\ 3 \end{pmatrix} \tag{2.0.1}$$

$$\mathbf{C} - \mathbf{B} = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix} \tag{2.0.2}$$

Fig. 0: $\triangle ABC$

We know that ,

$$\mathbf{B} = arccos\left(\frac{(\mathbf{A}-\mathbf{B})^T(\mathbf{C}-\mathbf{B})}{\|\mathbf{A}-\mathbf{B}\|\|\mathbf{C}-\mathbf{B}\|} \right) \tag{2.0.3}$$

Then

$$\|\mathbf{A} - \mathbf{B}\| = \sqrt{17} \tag{2.0.4}$$
$$\|\mathbf{C} - \mathbf{B}\| = \sqrt{6} \tag{2.0.5}$$
$$(\mathbf{A} - \mathbf{B})^{\mathbf{T}}(\mathbf{C} - \mathbf{B}) = 10 \tag{2.0.6}$$

Substitute above values in (2.0.3) then ,

$$\mathbf{B} = \cos^{-1}\left(\frac{10}{\sqrt{17}\sqrt{6}} \right) \tag{2.0.7}$$
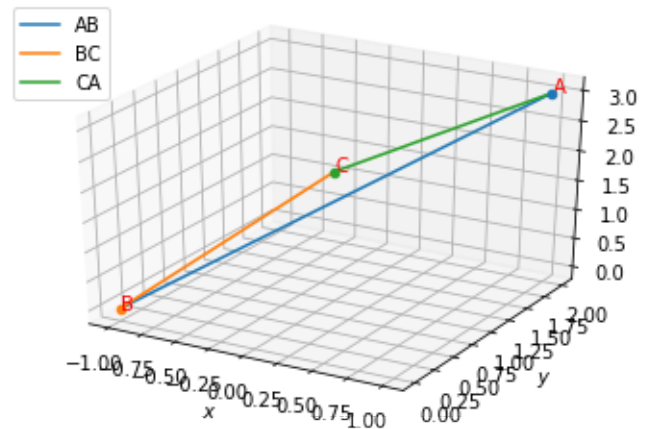$$\mathbf{B} = 66.15 \tag{2.0.8}$$