2.10.30

EE25BTECH11001 - Aarush Dilawri

Question:
The points with position vectors $60\mathbf{i} + 3\mathbf{j}$, $40\mathbf{i} - 6\mathbf{j}$, $a\mathbf{i} - 52\mathbf{j}$ are collinear if

(a) a = -40
(b) a = 40
(c) a = 20
(d) None of these

Solution:
We have position vectors

$$\mathbf{A} = \begin{pmatrix} 60 \\ 3 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} 40 \\ -6 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} a \\ -52 \end{pmatrix}. \tag{1}$$

Now,

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} -20 \\ -9 \end{pmatrix}, \tag{2}$$

$$\mathbf{C} - \mathbf{A} = \begin{pmatrix} a - 60 \\ -55 \end{pmatrix}. \tag{3}$$

For collinearity, we require

$$\mathbf{C} - \mathbf{A} = \lambda(\mathbf{B} - \mathbf{A}). \tag{4}$$

Thus,

$$\begin{pmatrix} a - 60 \\ -55 \end{pmatrix} = \lambda \begin{pmatrix} -20 \\ -9 \end{pmatrix}. \tag{5}$$

From the second component,

$$-55 = -9\lambda \tag{6}$$

$$\Rightarrow \lambda = \frac{55}{9}. \tag{7}$$

Substituting in the first component,

$$a = -\frac{560}{9}. \tag{8}$$

Therefore, the answer is (d) None of these.

See Fig. 0 ,

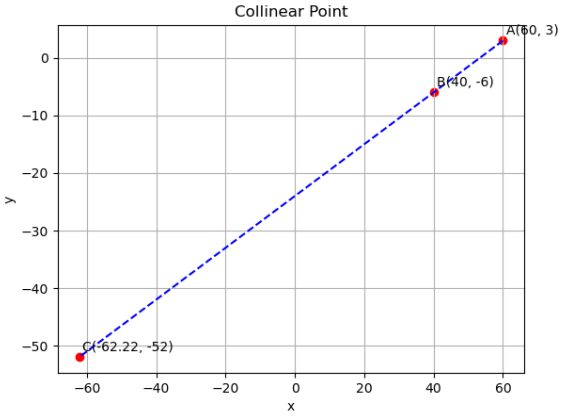

Fig. 4