

## Vectors 2 Exercise IIB

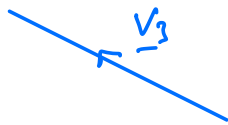
1)



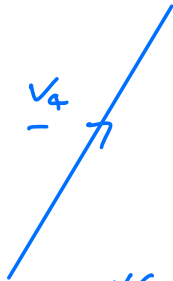
$$\underline{v}_1 = 8\underline{i} = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$$



$$\underline{v}_2 = 9\underline{i} + 3\underline{j} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}$$



$$\underline{v}_3 = -4\underline{i} + 2\underline{j} = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$$



$$\underline{v}_4 = 3\underline{i} + 5\underline{j} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$$



$$\underline{v}_5 = -3\underline{i} - 2\underline{j} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$$



$$\underline{v}_6 = -5\underline{j} = \begin{pmatrix} 0 \\ -5 \end{pmatrix}$$

$$3) \quad \underline{a} = \begin{pmatrix} 9 \\ 7 \end{pmatrix} \quad \underline{b} = \begin{pmatrix} 11 \\ -3 \end{pmatrix} \quad \underline{c} = \begin{pmatrix} -8 \\ -1 \end{pmatrix}$$

$$a) \quad 5\underline{a} = 5 \begin{pmatrix} 9 \\ 7 \end{pmatrix} = \begin{pmatrix} 45 \\ 35 \end{pmatrix}$$

$$b) \quad -\frac{1}{2} \underline{c} = -\frac{1}{2} \begin{pmatrix} -8 \\ -1 \end{pmatrix} = \begin{pmatrix} 4 \\ \frac{1}{2} \end{pmatrix}$$

$$c) \quad \underline{a} + \underline{b} + \underline{c} = \begin{pmatrix} 9 \\ 7 \end{pmatrix} + \begin{pmatrix} 11 \\ -3 \end{pmatrix} + \begin{pmatrix} -8 \\ -1 \end{pmatrix} = \begin{pmatrix} 12 \\ 3 \end{pmatrix}$$

$$d) \quad 2\underline{a} - \underline{b} + \underline{c} = 2 \begin{pmatrix} 9 \\ 7 \end{pmatrix} - \begin{pmatrix} 11 \\ -3 \end{pmatrix} + \begin{pmatrix} -8 \\ -1 \end{pmatrix} \\ = \begin{pmatrix} -1 \\ 16 \end{pmatrix}$$

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$$5) \quad \underline{c} = 3\underline{i} + 4\underline{j} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

$$a) \quad \underline{d} = \underline{i} - 2\underline{j} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$

$\underline{c} + \lambda \underline{d}$  is parallel to  $\underline{i} + \underline{j}$

$$\begin{pmatrix} 3 \\ 4 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -2 \end{pmatrix} = \mu \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$$3 + \lambda = \mu \quad \textcircled{1}$$

$$4 - 2\lambda = \mu \quad \textcircled{2}$$

$$\textcircled{1} - \textcircled{2}$$

$$-1 + 3\lambda = 0$$

$$3\lambda = 1$$

$$\lambda = \frac{1}{3}$$

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b) Find  $\mu$

$\mu \underline{c} + \underline{d}$  is parallel to  $\underline{i} + 3\underline{j}$

$$\mu \begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 1 \\ -2 \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$3\mu + 1 = \lambda \quad (1)$$

$$4\mu - 2 = 3\lambda \quad (2)$$

$$9\mu + 3 = 3\lambda \quad (3)$$

$$(1) \times 3$$

$$(3) - (2)$$

$$5\mu + 5 = 0$$

$$5\mu = -5$$

$$\mu = -1$$

Classwork - last 2 parts of Q 2, 3, 4, 5

$$2g) \quad \underline{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad \underline{b} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$$

$$\begin{aligned} 4\underline{b} - \underline{a} &= 4 \begin{pmatrix} 2 \\ 3 \end{pmatrix} - \begin{pmatrix} 4 \\ -1 \end{pmatrix} = \begin{pmatrix} 4 \\ 13 \end{pmatrix} \\ &= 4\underline{i} + 13\underline{j} \end{aligned}$$

$$\begin{aligned} h) \quad 2\underline{a} - 3\underline{b} &= 2 \begin{pmatrix} 2 \\ 3 \end{pmatrix} - 3 \begin{pmatrix} 4 \\ -1 \end{pmatrix} = \begin{pmatrix} -8 \\ 9 \end{pmatrix} \\ &= -8\underline{i} + 9\underline{j} \end{aligned}$$

$$3) \quad \underline{a} = \begin{pmatrix} 9 \\ 7 \end{pmatrix} \quad \underline{b} = \begin{pmatrix} 11 \\ -3 \end{pmatrix} \quad \underline{c} = \begin{pmatrix} -8 \\ -1 \end{pmatrix}$$

$$\begin{aligned} e) \quad 2\underline{b} + 2\underline{c} - 3\underline{a} &= 2\begin{pmatrix} 11 \\ -3 \end{pmatrix} + 2\begin{pmatrix} -8 \\ -1 \end{pmatrix} - 3\begin{pmatrix} 9 \\ 7 \end{pmatrix} \\ &= \begin{pmatrix} 22 \\ -6 \end{pmatrix} + \begin{pmatrix} -16 \\ -2 \end{pmatrix} + \begin{pmatrix} -27 \\ -21 \end{pmatrix} \\ &= \begin{pmatrix} -21 \\ -29 \end{pmatrix} \end{aligned}$$

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$$4) \quad \underline{a} = 2\underline{i} + 5\underline{j} = \begin{pmatrix} 2 \\ 5 \end{pmatrix} \quad \underline{b} = 3\underline{i} - \underline{j} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$$

a)  $\underline{a} + \lambda\underline{b}$  is parallel to  $\underline{i}$

$$\begin{pmatrix} 2 \\ 5 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -1 \end{pmatrix} = \mu \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$\begin{aligned} 2 + 3\lambda &= \mu \\ 5 - \lambda &= 0 \end{aligned} \quad \Rightarrow \quad \underline{\underline{\lambda = 5}}$$

b)  $\mu\underline{a} + \underline{b}$  parallel to  $\underline{j}$

$$\mu \begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 3 \\ -1 \end{pmatrix} = \lambda \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$\begin{aligned} 2\mu + 3 &= 0 \\ 5\mu - 1 &= \lambda \end{aligned} \quad \Rightarrow \quad \underline{\underline{\mu = -\frac{3}{2}}}$$

$$s \quad \underline{c} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad \underline{d} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$

c)  $\underline{c} - s \underline{d}$  parallel to  $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$

$$\begin{pmatrix} 3 \\ 4 \end{pmatrix} - s \begin{pmatrix} 1 \\ -2 \end{pmatrix} = t \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$

$$3 - s = 2t \quad (1)$$

$$4 + 2s = t \quad (2)$$

$$(2) \times 2 \quad 8 + 4s = 2t \quad (3)$$

$$(3) - (1) \quad 5 + 5s = 0$$

$$5s = -5$$

$$s = -1$$


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d)  $\underline{d} - t \underline{c}$  parallel to  $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$

$$\begin{pmatrix} 1 \\ -2 \end{pmatrix} - t \begin{pmatrix} 3 \\ 4 \end{pmatrix} = w \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

$$1 - 3t = -2w \quad (1)$$

$$-2 - 4t = 3w \quad (2)$$

$$(1) \times 3 \quad 3 - 9t = -6w \quad (3)$$

$$(2) \times 2 \quad -4 - 8t = 6w \quad (4)$$

$$(3) + (4) \quad -1 - 17t = 0$$

$$-1 = 17t$$

$$t = -\frac{1}{17}$$


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Classwork Q6, 7, 8, 9, 10

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