

## Exercise 12J - Extra Examples

- ① Find the equation of the line parallel to vector  $\mathbf{a}$  and passing through point  $B$  with position vector  $\mathbf{b}$  as given

$$\textcircled{a} \quad \mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

\* if parallel to  $\mathbf{a}$ ,  
that is your  
direction vector

$$r = \underset{\substack{\uparrow \\ \text{position vector}}}{\begin{pmatrix} -1 \\ 2 \end{pmatrix}} + t \underset{\substack{\uparrow \\ \text{direction vector}}}{\begin{pmatrix} 3 \\ 2 \end{pmatrix}}$$

- ② Find a vector equation of the line which passes through the two points  $(4, 5)$  and  $(3, -2)$

Find a vector through the two points (either direction)

$$\cancel{\mathbf{b}} \begin{pmatrix} 4-3 \\ 5-(-2) \end{pmatrix} = \begin{pmatrix} 1 \\ 7 \end{pmatrix} \leftarrow \text{direction vector}$$

position vector — (pick a point)  $\begin{pmatrix} 4 \\ 5 \end{pmatrix}$

one possible answer  $r = \begin{pmatrix} 4 \\ 5 \end{pmatrix} + t \begin{pmatrix} 1 \\ 7 \end{pmatrix}$

③ Find an equation of The line perpendicular to vector  $\mathbf{a}$  and passing through point B with position vector  $\mathbf{b}$  as given

①  $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$   $\mathbf{b} = \begin{pmatrix} -1 \\ 6 \end{pmatrix}$

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix} \cdot \begin{pmatrix} p_1 \\ p_2 \end{pmatrix} = 0 \quad 3p_1 + 2p_2 = 0$$

$p_1 = 2 \quad p_2 = -3$   $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$   
direction vector  $\rightarrow$

$$r = \begin{pmatrix} -1 \\ 6 \end{pmatrix} + t \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$