9.2) Equation of a plane in three dimensions

Worked example	Your turn
A plane Π passes through the points $A(1,-2,2), B(-3,-2,1), C(5,4,3)$ Find the equation of the plane Π in the form r $= \boldsymbol{a} + \lambda \boldsymbol{b} + \mu \boldsymbol{c}$	A plane Π passes through the points $A(2,2-1), B(3,2,-1), C(4,3,5)$ Find the equation of the plane Π in the form r $= \boldsymbol{a} + \lambda \boldsymbol{b} + \mu \boldsymbol{c}$ $$r = 2\boldsymbol{i} + 2\boldsymbol{j} - \boldsymbol{k} + \lambda \boldsymbol{i} + \mu(2\boldsymbol{i} + \boldsymbol{j} + 6\boldsymbol{k})$$ $$r = \begin{pmatrix} 2 \\ 2 \\ -1 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 1 \\ 6 \end{pmatrix}$$

Worked example

Verify that the point P with position vector $\begin{pmatrix} 2 \\ -3 \\ 2 \end{pmatrix}$

lies in the plane with vector equation

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

Your turn

Verify that the point P with position vector $\begin{pmatrix} 2 \\ 2 \\ -1 \end{pmatrix}$

lies in the plane with vector equation

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

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