

The points A and B are given by A(-8,1,-2) and B(-2,-1,2).

A plane Π is defined by the equation $2x - y - 3z = -8$.

- Find a vector equation of the line L passing through the points A and B.
- Find the coordinates of the point of intersection of the line and the plane.

a)

Find the direction of the line:

$$\begin{aligned}\overrightarrow{AB} &= \overrightarrow{OB} - \overrightarrow{OA} \\ &= \begin{pmatrix} -2 \\ -1 \\ 2 \end{pmatrix} - \begin{pmatrix} -8 \\ 1 \\ -2 \end{pmatrix} = \begin{pmatrix} 6 \\ -2 \\ 4 \end{pmatrix}\end{aligned}$$

Equation of the line:

$$\mathbf{r} = \begin{pmatrix} -8 \\ 1 \\ -2 \end{pmatrix} + \lambda \begin{pmatrix} 6 \\ -2 \\ 4 \end{pmatrix}$$

*there are other possible correct answers for this line

b)

Write line in parametric form $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -8 \\ 1 \\ -2 \end{pmatrix} + \lambda \begin{pmatrix} 6 \\ -2 \\ 4 \end{pmatrix}$

$$x = -8 + 6\lambda$$

$$y = 1 - 2\lambda$$

$$z = -2 + 4\lambda$$

Substitute these values into
equation of the plane

$$2(-8 + 6\lambda) - (1 - 2\lambda) - 3(-2 + 4\lambda) = -8$$

Solve for λ

$$-16 + 12\lambda - 1 + 2\lambda + 6 - 12\lambda = -8$$

$$2\lambda = 3$$

$$\lambda = 1.5$$

Substitute in to equation of line

$$x = -8 + 6(1.5) = 1$$

$$y = 1 - 2(1.5) = -2$$

$$z = -2 + 4(1.5) = 4$$

Point of intersection

$$(1, -2, 4)$$