Cartesian Form of Equation of a Straight Line

Examples

1. Find the Cartesian equation of the line with equation $r=\left(\begin{matrix}4\\3\\-2\end{matrix}\right)+λ\left(\begin{matrix}-1\\2\\5\end{matrix}\right)$.
2. Find the Cartesian equation of the line with equation $r=\left(\begin{matrix}2\\5\\0\end{matrix}\right)+λ\left(\begin{matrix}1\\3\\-2\end{matrix}\right)$.
3. The Cartesian equation of a line is $y=3x+2$. Find the vector form of the equation of the line.
4. The Cartesian equation of a line is $\frac{x-2}{3}=\frac{y+5}{1}=\frac{z}{4}$. Find the vector form of the equation of the line.

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The Equation of a Plane

The equation of a plane can be written in vector form.

Let the point R, with position vector $r$ be an arbitrary point on the plane ∏.

Suppose ∏ passes through the point A, with position vector **a**.

Let **b** and **c** be non-parallel vectors in the plane.

The position of the general point R can be found by

$$r=a+λb+μc$$

**This is one of several ways of writing the equation of a plane.**

$$b$$

$$a$$

$$c$$

$$r$$

Example

A plane $Π$ passes through the points $A\left(2,6,-1\right), B\left(7,2,-1\right), C\left(4,2,5\right)$

Find the equation of the plane $Π$ in the form $a+λb+μc$

Example

Verify that the point $P$ with position vector $\left(\begin{matrix}2\\2\\-1\end{matrix}\right)$ lies in the plane with vector equation
$r=\left(\begin{matrix}3\\4\\-2\end{matrix}\right)+λ\left(\begin{matrix}2\\1\\1\end{matrix}\right)+μ\left(\begin{matrix}1\\-1\\2\end{matrix}\right)$

Test Your Understanding