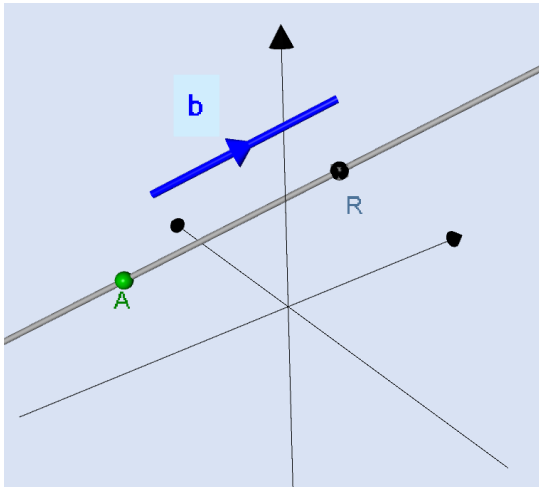


Equation of Lines

The equation of a line in vector form is very useful



$$\mathbf{r} = \overrightarrow{OA} + \lambda \mathbf{b}$$

A is a point
on the line

The line is
parallel to \mathbf{b}

2 dimensions

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

(1,6) is a point
on the line

The line is
parallel to $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$

3 dimensions

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

(1,-2,3) is a
point on the
line

The line is parallel
to $\begin{pmatrix} -1 \\ 3 \\ 4 \end{pmatrix}$

It is important that you understand all the different forms and convert quickly between them

$\mathbf{r} = \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$	Vector Form	The line contains the point (1, 2, 0) The line is parallel to $\begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$
$x = 1 + 2\lambda$ $y = 2 + 1\lambda$ $z = 0 - 1\lambda$	Parametric Form	
$\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-0}{-1}$	Cartesian Form	