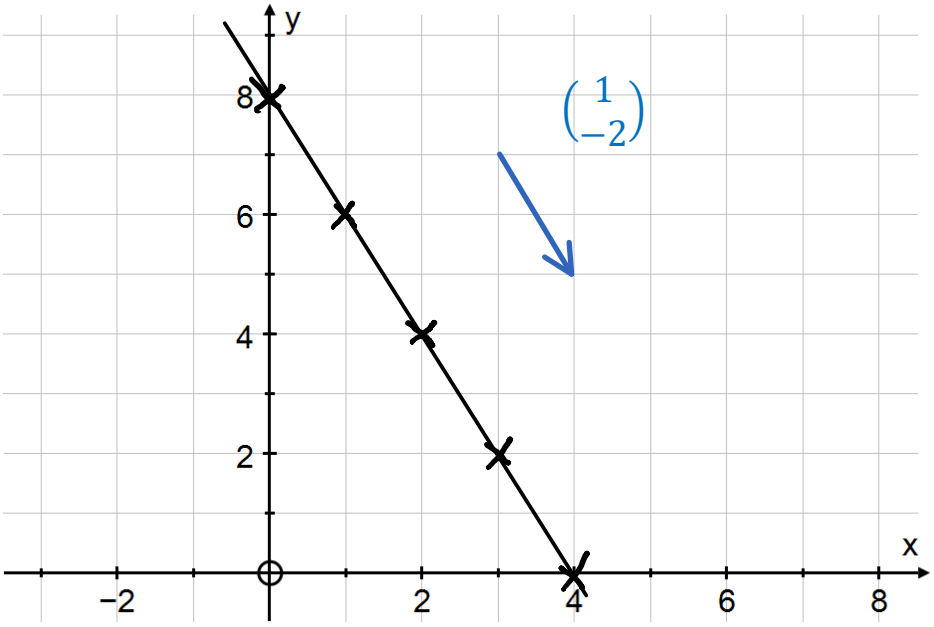
Vector Equation of Lines

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

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



When $\boldsymbol{\lambda = 0}$ $\quad \boldsymbol{r} = \begin{pmatrix} 1 \\ 6 \end{pmatrix}$

When $\boldsymbol{\lambda = 1}$ $\quad \boldsymbol{r} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

When $\boldsymbol{\lambda = 2}$ $\quad \boldsymbol{r} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

When $\boldsymbol{\lambda = 3}$ $\quad \boldsymbol{r} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$

When $\boldsymbol{\lambda = -1}$ $\quad \boldsymbol{r} = \begin{pmatrix} 0 \\ 8 \end{pmatrix}$

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

(1,6) is a point on the line

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

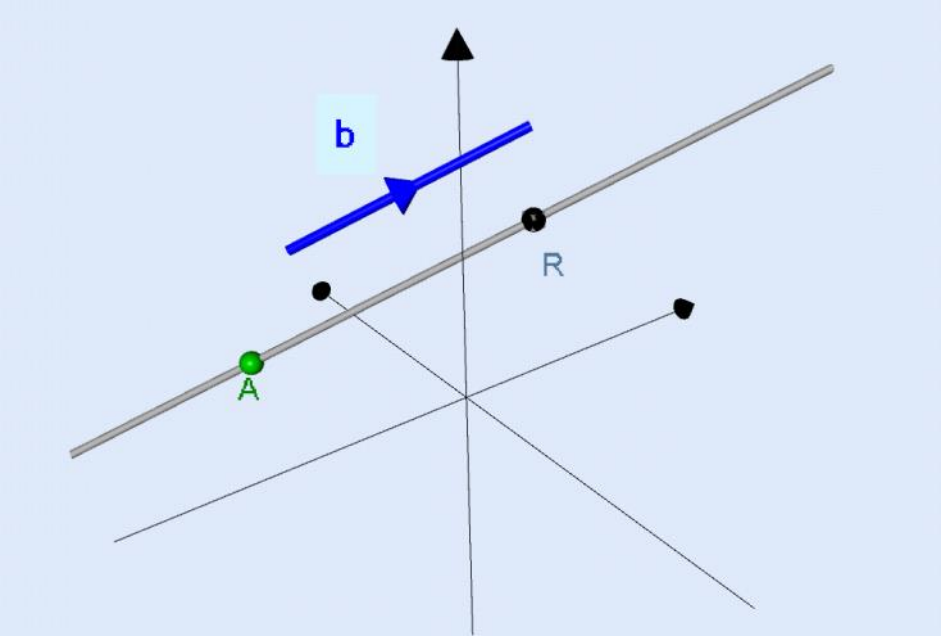
Vector Form $\quad \boldsymbol{r} = \overrightarrow{OA} + \lambda \boldsymbol{b}$

A is a point on the line

the line is parallel to the vector $\boldsymbol{b}$

In 3D, the equation is exactly the same!

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



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

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

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