

Vektorgeometrie

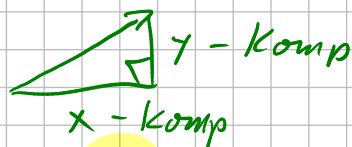
Vektor: Richtung, Länge



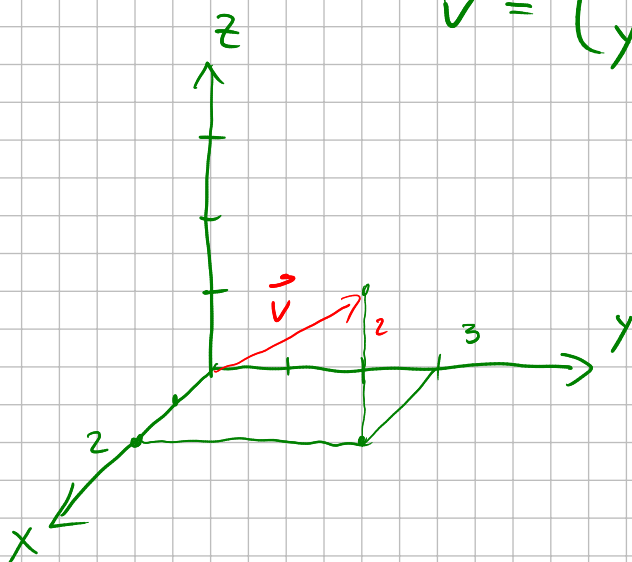
Komponenten: $\vec{v} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ ← x-Richtung
← y-Richtung

$\vec{v} = \begin{pmatrix} -2 \\ 1 \\ 3 \end{pmatrix}$ ← z-Richtung

Länge 2D



$$|\vec{v}| = \sqrt{x^2 + y^2} = |\vec{v}|$$



$$\vec{v} = \begin{pmatrix} 2 \\ 3 \\ 2 \end{pmatrix}$$

$$|\vec{v}| = \sqrt{2^2 + 3^2 + 2^2} \\ = \underline{\underline{\sqrt{17}}}$$

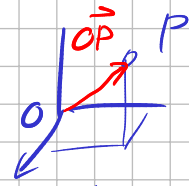
Vektorarithmetik

Ortsvektor

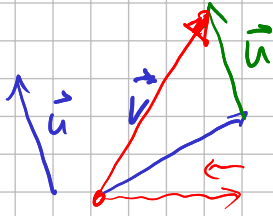
Gegeben Punkt P

Ortsvektor von P : $\vec{OP} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$ Komponenten

$P = (x, y, z)$ Koordinaten



Addition



$$\vec{u} + \vec{v} = \begin{pmatrix} x_u \\ y_u \\ z_u \end{pmatrix} + \begin{pmatrix} x_v \\ y_v \\ z_v \end{pmatrix} = \begin{pmatrix} x_u + x_v \\ y_u + y_v \\ z_u + z_v \end{pmatrix}$$

$$A = (2, -4, 1) \quad \vec{AB} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}$$

Gesucht B ?

$$\vec{OB} = \vec{OA} + \vec{AB} = \begin{pmatrix} 2 \\ -4 \\ 1 \end{pmatrix} + \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix} = \begin{pmatrix} 3 \\ -2 \\ -2 \end{pmatrix} \rightarrow B = (3, -2, -2)$$

Gegenvektor $-\vec{v} = \begin{pmatrix} -x \\ -y \\ -z \end{pmatrix}$ wenn $\vec{v} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$

$$\vec{u} - \vec{v} = \vec{u} + (-\vec{v})$$

Skalierung

$$\lambda \cdot \vec{v}$$

$$\lambda \in \mathbb{R}$$

$$\vec{v} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}, \quad \lambda \vec{v} = \lambda \cdot \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} \lambda x \\ \lambda y \\ \lambda z \end{pmatrix}$$

Nullvektor

$$\vec{0} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

hat jede mögliche Richtung.

$$|\lambda \cdot \vec{v}| = |\lambda| \cdot |\vec{v}|$$