

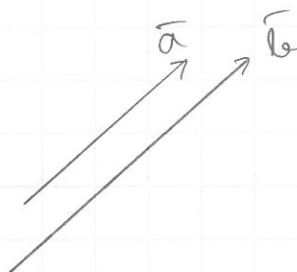
2. vektorin ominaisuudet

$$\begin{array}{c} \xrightarrow{3} \vec{a} \\ \downarrow | \\ \xrightarrow{1} \frac{1}{3}\vec{a} = \frac{\vec{a}}{3} \end{array}$$

$$\begin{array}{c} \xrightarrow{5} \vec{a} \\ \downarrow | \\ \xrightarrow{1} \frac{1}{5}\vec{a} = \frac{\vec{a}}{5} \end{array}$$

$$\begin{array}{c} \xrightarrow{\vec{a}} \\ \downarrow | \\ \xrightarrow{1} \vec{a}^0 \end{array} \quad \boxed{\vec{a}^0 = \frac{\vec{a}}{|\vec{a}|}}$$

\vec{a} :N SUUNTAINEN YKSIKKÖVEKTORI



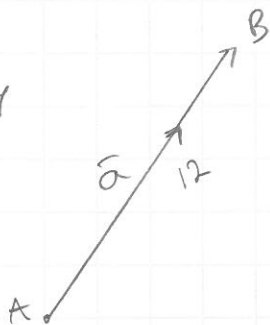
$$\boxed{\vec{a} \parallel \vec{b} \Leftrightarrow \vec{a} = t\vec{b}, t \in \mathbb{R}}$$

YHDENSUUNTAISUUS-
EHTO

Lause Olkoot \vec{a}, \vec{b} ja \vec{c} vektorit jotka eivät ole samassa tasossa. Tällöin jokainen avaruuden vektori \vec{d} voidaan esittää vain yhdellä tavalla muodossa

$$\vec{d} = r\vec{a} + s\vec{b} + t\vec{c}, \quad r, s, t \in \mathbb{R}$$

2.4



$$A = (5, -2, 3)$$

$$\vec{a} = 6\vec{i} - 6\vec{j} + 3\vec{k}$$

$$|\vec{a}| = \sqrt{6^2 + (-6)^2 + 3^2} = 9$$

$$\overline{AB} = \frac{12}{9}\vec{a} = \frac{4}{3}\vec{a} = 8\vec{i} - 8\vec{j} + 4\vec{k}$$

$$\uparrow \text{TÄI: } \overline{AB} = 12\vec{a}^0 = 12 \cdot \frac{\vec{a}}{|\vec{a}|} = 12 \cdot \frac{\vec{a}}{9} = \frac{4}{3}\vec{a} \downarrow$$

$$\Rightarrow B = (5+8, -2+(-8), 3+4) = \underline{\underline{(13, -10, 7)}}$$

2.5

$$\vec{w} = x\vec{a} + y\vec{b} + z\vec{c}$$

$$\Leftrightarrow 16\vec{i} - 48\vec{j} + 96\vec{k} = x(\vec{i} - 2\vec{j}) + y(3\vec{j} + \vec{k}) + z(2\vec{i} - 4\vec{k})$$

$$\Leftrightarrow \underline{\underline{16\vec{i} - 48\vec{j} + 96\vec{k}}} = \underline{\underline{(x+2z)\vec{i}}} + \underline{\underline{(-2x+3y)\vec{j}}} + \underline{\underline{(y-4z)\vec{k}}}$$

$$\Rightarrow \begin{cases} 16 = x + 2z & (1) \\ -48 = -2x + 3y & (2) \\ 96 = y - 4z & (3) \end{cases} \quad \left. \begin{array}{l} (2): -48 = -2x + 3y \\ 2 \cdot (1) + (3): 128 = 2x + y \end{array} \right\} \begin{array}{l} 80 = 4y \quad \Leftrightarrow y = 20 \end{array}$$

$$(2): -48 = -2x + 3 \cdot 20 \quad \Leftrightarrow -108 = -2x \quad \Leftrightarrow x = 54$$

$$(1): 16 = 54 + 2z \quad \Leftrightarrow 2z = -38 \quad \Leftrightarrow z = -19$$

Vast. $\vec{w} = 54\vec{a} + 20\vec{b} - 19\vec{c}$