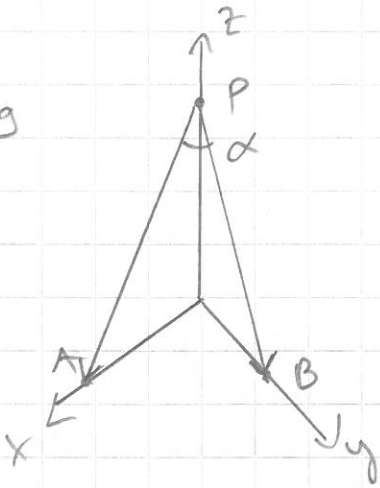


$$|\vec{c}| = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{14}$$

$\Rightarrow |\vec{a}|$ lyhyin sivin \Rightarrow vastainen kulma α pienin

$$\begin{aligned} \cos \alpha &= \cos(-\vec{b}, -\vec{c}) = \frac{-\vec{b} \cdot (-\vec{c})}{|-\vec{b}| |-\vec{c}|} = \frac{\vec{b} \cdot \vec{c}}{|\vec{b}| |\vec{c}|} = \frac{3 \cdot 1 + 1 \cdot 2 + 1 \cdot 3}{\sqrt{11} \sqrt{14}} \\ &= \frac{8}{\sqrt{11} \sqrt{14}} \Rightarrow \alpha = 49,9^\circ \end{aligned}$$

3,19



$$A = (18,4; 0; 0)$$

$$B = (0; 18,4; 0)$$

$$P = (0; 0; 23,8)$$

$$\vec{PA} = 18,4 \vec{i} - 23,8 \vec{k}$$

$$\vec{PB} = 18,4 \vec{j} - 23,8 \vec{k}$$

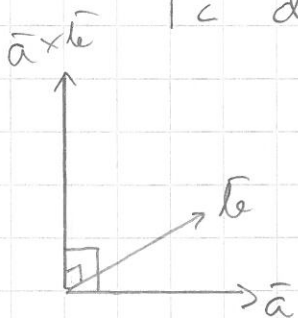
$$\cos \alpha = \cos(\vec{PA}, \vec{PB}) = \frac{\vec{PA} \cdot \vec{PB}}{|\vec{PA}| |\vec{PB}|}$$

TAI: Kosinilauseella

4. Ristitulo

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = a \cdot d - b \cdot c$$

2-RIVINEN DETERMINANTTI



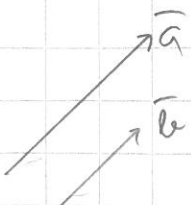
$$\vec{a} = x_1 \vec{i} + y_1 \vec{j} + z_1 \vec{k}$$

$$\vec{b} = x_2 \vec{i} + y_2 \vec{j} + z_2 \vec{k}$$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \end{vmatrix} = \begin{vmatrix} y_1 & z_1 \\ y_2 & z_2 \end{vmatrix} \vec{i} - \begin{vmatrix} x_1 & z_1 \\ x_2 & z_2 \end{vmatrix} \vec{j} + \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix} \vec{k}$$

RISTITULO

Huom. $\vec{a} \times \vec{b}$ on vektori, jolle $\vec{a} \times \vec{b} \perp \vec{a}, \vec{b}$



$$\vec{a} \parallel \vec{b} \Leftrightarrow \vec{a} \times \vec{b} = \vec{0}, \vec{a}, \vec{b} \neq \vec{0}$$