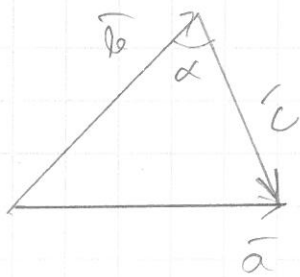


3.9



$$\vec{a} = 2\vec{i} - \vec{j} - 2\vec{k} \Rightarrow |\vec{a}| = \sqrt{2^2 + (-1)^2 + (-2)^2} = 3$$

$$\vec{b} = 3\vec{i} + \vec{j} + \vec{k} \Rightarrow |\vec{b}| = \sqrt{3^2 + 1^2 + 1^2} = \sqrt{11}$$

$$\vec{c} = -\vec{b} + \vec{a} = -\vec{i} - 2\vec{j} - 3\vec{k}$$

$$\Rightarrow |\vec{c}| = \sqrt{(-1)^2 + (-2)^2 + (-3)^2} = \sqrt{14}$$

\Rightarrow Siisvektorit \vec{a} on lyhin \Rightarrow vastainen kulma α on piennin

$$\alpha = \angle(-\vec{b}, \vec{c})$$

$$\cos \alpha = \cos(-\vec{b}, \vec{c}) = \frac{-\vec{b} \cdot \vec{c}}{|\vec{b}| |\vec{c}|} = \frac{(-3) \cdot (-1) + (-1) \cdot (-2) + (-1) \cdot (-3)}{\sqrt{11} \sqrt{14}}$$

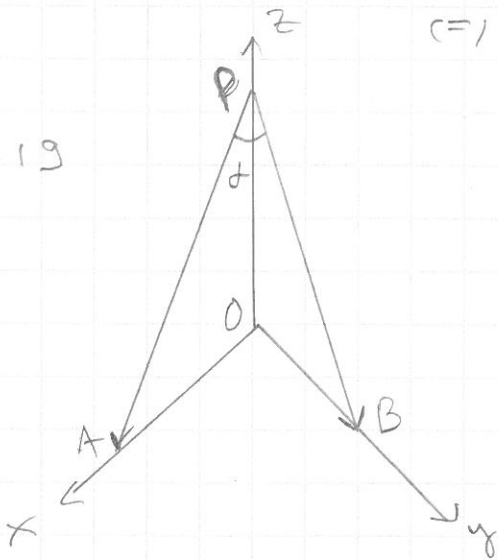
$$= \frac{8}{\sqrt{11} \sqrt{14}} \Rightarrow \alpha = \angle(-\vec{b}, \vec{c}) = 49,9^\circ$$

TAI: Kosinilause: $|\vec{a}|^2 = |\vec{b}|^2 + |\vec{c}|^2 - 2|\vec{b}||\vec{c}|\cos \alpha$

$$\Rightarrow 3^2 = (\sqrt{11})^2 + (\sqrt{14})^2 - 2 \cdot \sqrt{11} \cdot \sqrt{14} \cos \alpha$$

$$\Rightarrow \cos \alpha = \frac{8}{\sqrt{11} \sqrt{14}} \Rightarrow \alpha = 49,9^\circ$$

3.19



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

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

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

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

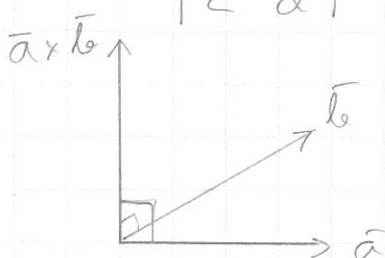
$$\vec{PB} = 18,4\vec{j} - 23,8\vec{k}$$

$$\cos \alpha = \cos(\vec{PA}, \vec{PB}) = \frac{\vec{PA} \cdot \vec{PB}}{|\vec{PA}| |\vec{PB}|} = \dots \Rightarrow \alpha = 51,3^\circ$$

4. Ristitulo

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

2-RIVINEN DETERMINANTTI



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

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