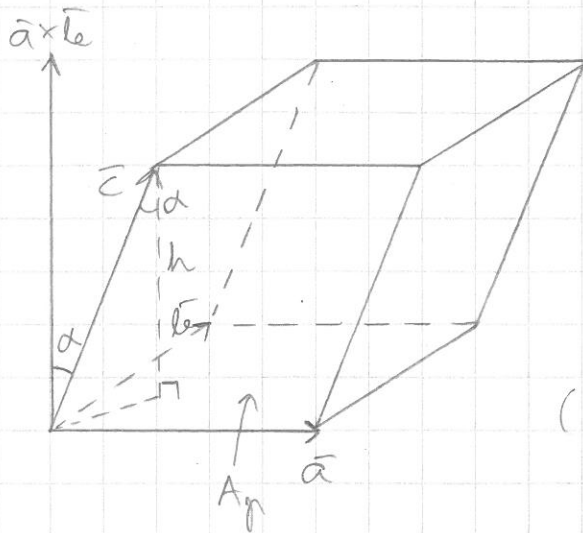


$\vec{a}, \vec{b}$ ja $\vec{c}$:n virittämä särmiö



$$\cos \alpha = \frac{h}{|\vec{c}|} \quad (\Rightarrow) \quad h = |\vec{c}| \cos \alpha$$

$$V = A_g h = |\vec{a} \times \vec{b}| |\vec{c}| \cos \alpha \\ = (\vec{a} \times \vec{b}) \cdot \vec{c}$$

(jos $\vec{a} \times \vec{b}$ sijaitsee käänteisellä puolella alaspäin
 $\cos(180^\circ - \alpha) = -\cos \alpha \Rightarrow V < 0$)

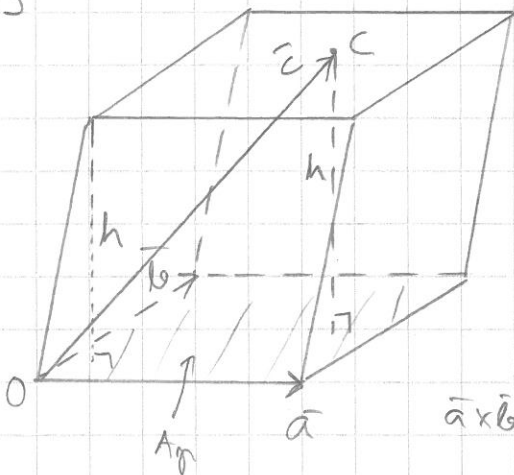
$$\Rightarrow \boxed{V = |(\vec{a} \times \vec{b}) \cdot \vec{c}|} \quad \text{SÄRMION TILAVUUS} \\ \text{(SKALAARIKOLMITULO)}$$

5.6 $\vec{a} = -2\hat{i} + \hat{j}$ $\vec{b} = \hat{i} - 3\hat{k}$ $\vec{c} = 3\hat{j} + 7\hat{k}$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2 & 1 & 0 \\ 1 & 0 & -3 \end{vmatrix} = -3\hat{i} - 6\hat{j} - \hat{k}$$

$$V = |(\vec{a} \times \vec{b}) \cdot \vec{c}| = |-3 \cdot 0 + (-6) \cdot 3 + (-1) \cdot 7| = |-25| = \underline{25}$$

5.13



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

$$\vec{b} = -3\hat{i} + \hat{j} + 3\hat{k}$$

$$C = (-3, -1, 4) \Rightarrow \vec{c} = -3\hat{i} - \hat{j} + 4\hat{k}$$

Vektorien $\vec{a}, \vec{b}$ ja $\vec{c}$ määräämän (virittämän) särmiön tilavuus:

$$V = |(\vec{a} \times \vec{b}) \cdot \vec{c}| = |22| = 22$$

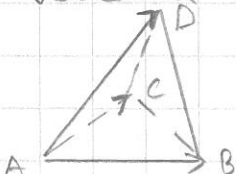
$$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 3 & 1 \\ -3 & 1 & 3 \end{vmatrix} = \dots = 8\hat{i} - 6\hat{j} + 10\hat{k}$$

$$(\vec{a} \times \vec{b}) \cdot \vec{c} = 8 \cdot (-3) + (-6) \cdot (-1) + 10 \cdot 4 = 22$$

Särmion pinta-ala: $A_g = |\vec{a} \times \vec{b}| = \sqrt{8^2 + (-6)^2 + 10^2} = \sqrt{200} \\ = \sqrt{100 \cdot 2} = 10\sqrt{2}$

Tilavuus: $V = A_g h \quad (\Rightarrow) \quad h = \frac{V}{A_g} = \frac{22}{10\sqrt{2}} = \frac{\sqrt{2}/11}{5\sqrt{2}} = \frac{11\sqrt{2}}{5 \cdot 2} = \underline{\underline{\frac{11\sqrt{2}}{10}}}$

5.18 Tetraedrin = pyramidi jonka pohja on kolmio



$$A = (-1, 2, -3), B = (-2, 1, 1), C = (-3, 4, -2)$$

$$D = (0, y, 0) \quad (y\text{-akselilla})$$