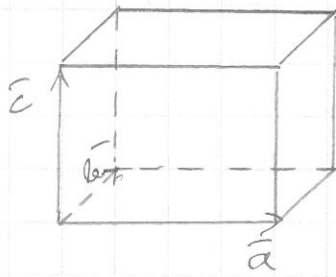


TA1: Korkiteuseella

3,21



$$\begin{aligned}\bar{a} &= 2\bar{i} - \bar{j} + \bar{k} \\ \bar{b} &= x\bar{i} + \bar{j} + 3\bar{k} \\ \bar{c} &= -2\bar{i} + y\bar{j} + z\bar{k}\end{aligned}$$

$$\begin{cases} \bar{a} \perp \bar{b} \Leftrightarrow \bar{a} \cdot \bar{b} = 2x - 1 + 3 = 0 & \Leftrightarrow 2x = -2 \Leftrightarrow x = -1 \\ \bar{a} \perp \bar{c} \Leftrightarrow \bar{a} \cdot \bar{c} = 2(-2) + (-1)y + 1z = -4 - y + z = 0 \\ \bar{b} \perp \bar{c} \Leftrightarrow \bar{b} \cdot \bar{c} = x(-2) + 1y + 3z = -2x + y + 3z = 0 \end{cases}$$

xy.

$$\Rightarrow \begin{cases} -4 - y + z = 0 \\ 2 + y + 3z = 0 \\ -2 + y + 3z = 0 \end{cases} \quad \Leftrightarrow \begin{aligned} z &= \frac{1}{2} \\ y &= -\frac{7}{2} \end{aligned}$$

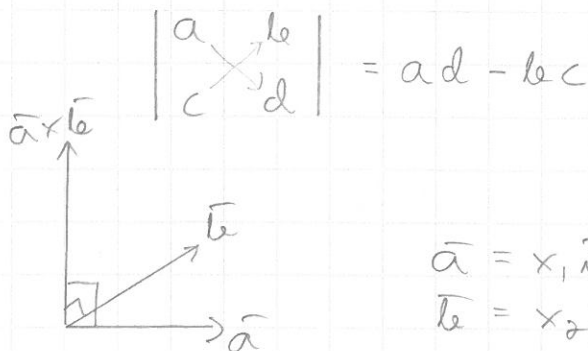
$$|\bar{a}| = \sqrt{2^2 + (-1)^2 + 1^2} = \sqrt{6}$$

$$|\bar{b}| = \dots = \sqrt{11}$$

$$|\bar{c}| = \dots = \frac{\sqrt{66}}{2}$$

$$\text{tilavuus: } V = |\bar{a}| |\bar{b}| |\bar{c}| = \dots = \underline{33}$$

4. Ristitulo



2-DIVINEN DETERMINANTTI

maol 8.19

$$\begin{aligned}\bar{a} &= x_1\bar{i} + y_1\bar{j} + z_1\bar{k} \\ \bar{b} &= x_2\bar{i} + y_2\bar{j} + z_2\bar{k}\end{aligned}$$

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

RISTITULO

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

$$4.4 \quad \bar{a} = \bar{i} + \bar{j} + \bar{k} \quad \bar{b} = 2\bar{i} - \bar{j} + 3\bar{k}$$

$$\begin{aligned} a) \quad \bar{a} \times \bar{b} &= \begin{vmatrix} \bar{i} & \bar{j} & \bar{k} \\ 1 & 1 & 1 \\ 2 & -1 & 3 \end{vmatrix} = \begin{vmatrix} 1 & 1 \\ -1 & 3 \end{vmatrix} \bar{i} - \begin{vmatrix} 1 & 1 \\ 2 & 3 \end{vmatrix} \bar{j} + \begin{vmatrix} 1 & 1 \\ 2 & -1 \end{vmatrix} \bar{k} \\ &= (1 \cdot 3 - (-1) \cdot 1) \bar{i} - (1 \cdot 3 - 2 \cdot 1) \bar{j} + (1 \cdot (-1) - 2 \cdot 1) \bar{k} = 4\bar{i} - \bar{j} - 3\bar{k} \end{aligned}$$