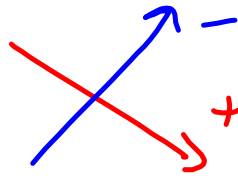


Skalaarikolmitulo

$$(\bar{a} \times \bar{b}) \cdot \bar{c} = \begin{vmatrix} a_x & a_y & a_z \\ b_x & b_y & b_z \\ c_x & c_y & c_z \end{vmatrix}$$

$$= a_x \begin{vmatrix} b_y & b_z \\ c_y & c_z \end{vmatrix} + a_y \begin{vmatrix} b_z & b_x \\ c_z & c_x \end{vmatrix} + a_z \begin{vmatrix} b_x & b_y \\ c_x & c_y \end{vmatrix}$$


Suuntaissärmön tilavuus

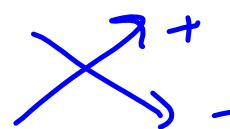
$$V_s = |(\bar{a} \times \bar{b}) \cdot \bar{c}|$$

Tetraedrin tilavuus

$$V_t = \frac{1}{6} |(\bar{a} \times \bar{b}) \cdot \bar{c}|$$

esim Tetraedrin kärkinä ovat origo sekä
 $A(1, -1, 2)$, $B(-2, 3, 0)$ ja $C(3, -2, 1)$.
 Laske tetraedrin tilavuus.

$$(\vec{a} \times \vec{b}) \cdot \vec{c} = \begin{vmatrix} 1 & -1 & 2 \\ -2 & 3 & 0 \\ 3 & -2 & 1 \end{vmatrix}$$



$$= 1 \cdot \begin{vmatrix} 3 & 0 \\ -2 & 1 \end{vmatrix} - 1 \cdot \begin{vmatrix} 0 & -2 \\ 1 & 3 \end{vmatrix} + 2 \begin{vmatrix} -2 & 3 \\ 3 & -2 \end{vmatrix}$$

$$= 1 \cdot \underbrace{(3 \cdot 1 - (-2) \cdot 0)}_{=3} - 1 \cdot \underbrace{(0 \cdot 3 - 1 \cdot (-2))}_{=2} + 2 \underbrace{(-2 \cdot (-2) - 3 \cdot 3)}_{=-5}$$

$$= 3 - 2 - 10 = -9$$

$$\frac{1}{6} \cdot 9 = 1\frac{1}{2}$$

V : Tetraedrin tilavuus
 on $1\frac{1}{2}$.
