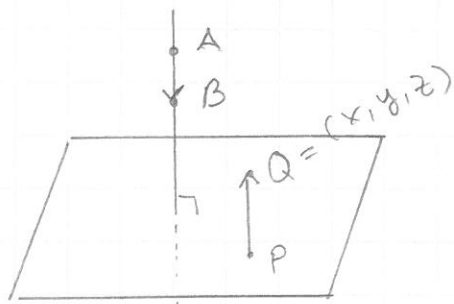


8.1



$$A = (5, 0, -4), B = (-2, 5, -1)$$

$$P = (1, -2, 5)$$

Piste Q on tasolle $\Leftrightarrow \overline{PQ} \perp \overline{AB}$

$$\Leftrightarrow \overline{PQ} \cdot \overline{AB} = 0$$

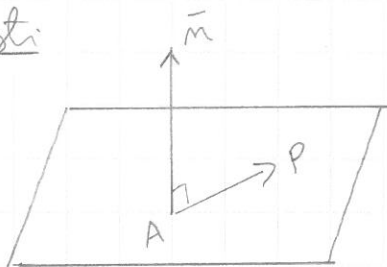
$$\Leftrightarrow -7 \cdot (x-1) + 5 \cdot (y+2) + 3 \cdot (z-5) = 0$$

$$\Leftrightarrow -7x + 5y + 3z + 2 = 0 \quad (\text{tasoa normaali-} \\ \text{muuttujan yhtälö})$$

$$\overline{AB} = -7\vec{i} + 5\vec{j} + 3\vec{k}$$

$$\overline{PQ} = (x-1)\vec{i} + (y+2)\vec{j} + (z-5)\vec{k}$$

Yleisesti:



Tasoa normaali-vektori $\vec{m} = a\vec{i} + b\vec{j} + c\vec{k}$

Tasoa piste $A = (x_0, y_0, z_0)$

Tasoa yleinen piste $P = (x, y, z)$

$$\vec{m} \perp \overline{AP}, \quad \overline{AP} = (x-x_0)\vec{i} + (y-y_0)\vec{j} + (z-z_0)\vec{k}$$

$$\Leftrightarrow \vec{m} \cdot \overline{AP} = 0$$

$$\Leftrightarrow a \cdot (x-x_0) + b \cdot (y-y_0) + c \cdot (z-z_0) = 0$$

$$\Leftrightarrow ax + by + cz + \underbrace{(-ax_0 - by_0 - cz_0)}_{\text{merkki } d} = 0$$

$$\Leftrightarrow \underline{ax + by + cz + d = 0} \quad (\text{tasoa normaali-} \\ \text{muoto})$$

8.1 $\Gamma_{TA1}: \vec{m} = \overline{AB} = -7\vec{i} + 5\vec{j} + 3\vec{k}$

$$\Rightarrow \text{tasoa: } -7x + 5y + 3z + d = 0$$

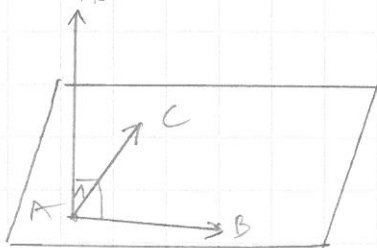
$$\text{Piste } P = (1, -2, 5) \text{ on tasolla: } -7 \cdot 1 + 5 \cdot (-2) + 3 \cdot 5 + d = 0$$

$$\Leftrightarrow d = 2$$

$$\Rightarrow \underline{-7x + 5y + 3z + 2 = 0}$$

8.2 $\parallel \overline{AB} \times \overline{AC} = \vec{m}$

8.12



$$A = (4, 0, 2), B = (-2, 1, 0), C = (0, 5, 0)$$

$$\overline{AB} = -6\vec{i} + \vec{j} - 2\vec{k} \quad \overline{AC} = -4\vec{i} + 5\vec{j} - 2\vec{k}$$

Tasoa normaali-vektori:

$$\vec{m} = \overline{AB} \times \overline{AC} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -6 & 1 & -2 \\ -4 & 5 & -2 \end{vmatrix} = \vec{i} \begin{vmatrix} 1 & -2 \\ 5 & -2 \end{vmatrix} - \vec{j} \begin{vmatrix} -6 & -2 \\ -4 & -2 \end{vmatrix} + \vec{k} \begin{vmatrix} -6 & 1 \\ -4 & 5 \end{vmatrix}$$

$$= (1 \cdot (-2) - (-2) \cdot 5)\vec{i} - ((-6) \cdot (-2) - (-2) \cdot (-4))\vec{j} + (-6 \cdot 5 - 1 \cdot (-4))\vec{k}$$

$$= 8\vec{i} - 4\vec{j} - 26\vec{k}$$

$$\Rightarrow \text{tasoa: } 8x - 4y - 26z + d = 0$$

8.2 $P = (4, 0, 2)$ on tasolla: $8 \cdot 4 - 4 \cdot 0 - 26 \cdot 2 + d = 0 \Leftrightarrow d = 20$

$$\Rightarrow \underline{8x - 4y - 26z + 20 = 0}$$