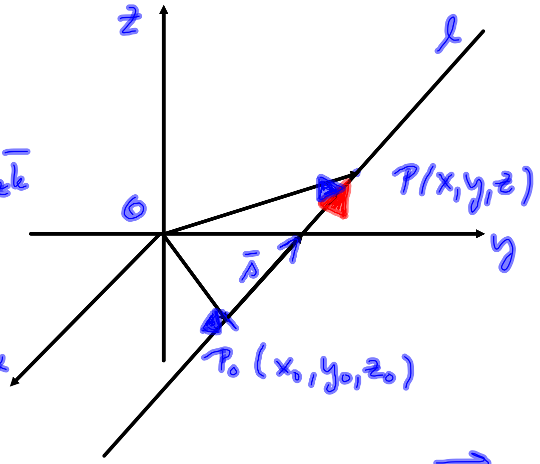
4.2 SUORA AVARUUDESSA

Suora l kulkee pisteen $P_0(x_0, y_0, z_0)$ kautta ja on vektorin $\bar{s} = s_x\bar{i} + s_y\bar{j} + s_z\bar{k}$ suuntainen.



Piste $P(x, y, z)$ on suoralla l, joss vektori $\overrightarrow{P_0P}$ on yhdensuuntainen suuntavektorin $\bar{s}$ kanssa

eli

saadaan vektorista $\bar{s}$ kertomalle nollasta eroavalla reaaliluvulla,

$$\overrightarrow{P_0P} = t\bar{s}.$$

Koska $\overrightarrow{P_0P} = \overrightarrow{OP} - \overrightarrow{OP_0}$, saamme suoran VEKTORIMUOTOISEKSI YHTÄLÖKSI.

$$\overrightarrow{OP} = \overrightarrow{P_0P} + \overrightarrow{OP_0} \iff \overrightarrow{OP} = \overrightarrow{OP_0} + t\bar{s}, \quad t \in \mathbb{R}$$

Pisteiden P_0 ja P paikkavektorit ovat

$\overrightarrow{OP_0} = x_0\bar{i} + y_0\bar{j} + z_0\bar{k}$ ja $\overrightarrow{OP} = x\bar{i} + y\bar{j} + z\bar{k}$

Koska $\overrightarrow{OP} = \overrightarrow{OP_0} + t\bar{s}$

$$x\bar{i} + y\bar{j} + z\bar{k} = x_0\bar{i} + y_0\bar{j} + z_0\bar{k} + t(s_x\bar{i} + s_y\bar{j} + s_z\bar{k})$$

$$x\bar{i} + y\bar{j} + z\bar{k} = x_0\bar{i} + y_0\bar{j} + z_0\bar{k} + ts_x\bar{i} + ts_y\bar{j} + ts_z\bar{k}$$

$$x\bar{i} + y\bar{j} + z\bar{k} = (x_0 + ts_x)\bar{i} + (y_0 + ts_y)\bar{j} + (z_0 + ts_z)\bar{k}$$

PARAMETRIMUOTOINEN YHTÄLÖ

$$\begin{cases} x = x_0 + ts_x \\ y = y_0 + ts_y \\ z = z_0 + ts_z \end{cases}, \quad t \in \mathbb{R}$$

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$$P_0 = (-2, 1, -4)$$

$$\bar{s} = \underbrace{2}_{s_x}\bar{i} \underbrace{-}_{s_y}\bar{j} + \underbrace{2}_{s_z}\bar{k}$$

$$\overrightarrow{OP_0} = \underbrace{-2}_{x_0}\bar{i} + \underbrace{\bar{j}}_{y_0} - \underbrace{4}_{z_0}\bar{k}$$

$$x\bar{i} + y\bar{j} + z\bar{k} = (x_0 + t s_x)\bar{i} + (y_0 + t s_y)\bar{j} + (z_0 + t s_z)\bar{k}$$

a) $\overrightarrow{OP} = (-2 + 2t)\bar{i} + (1 - t)\bar{j} + (-4 + 2t)\bar{k}, \quad t \in \mathbb{R}$

b)
$$\begin{cases} x = -2 + 2t \\ y = 1 - t \\ z = -4 + 2t \end{cases}$$

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$$P_0 = \overset{(x_0, y_0, y_0)}{(-2, 0, -3)}$$

$$P = (0, -2, 1)$$

$\bar{s} = ?$

$\overrightarrow{OP} = ?$

$\overrightarrow{OP_0} = ?$

$$\overrightarrow{P_0P} = \bar{s} = (0 - (-2))\bar{i} + (-2 - 0)\bar{j} + (1 - (-3))\bar{k}$$

$$= \underline{2}\bar{i} \underline{- 2}\bar{j} + \underline{4}\bar{k}$$

$$\begin{cases} x = -2 + 2t \\ y = -2t \\ z = -3 + 4t \end{cases}, t \in \mathbb{R} \qquad \begin{cases} x = x_0 + \underline{t}\bar{s}_x \\ y = y_0 + \underline{t}\bar{s}_y \\ z = z_0 + \underline{t}\bar{s}_z \end{cases}$$

leikkaako y-aks.?

$$\begin{cases} x = -2 + 2t = 0 & \Leftrightarrow \quad t = 1 \\ z = -3 + 4t = 0 & \text{sij. } t = 1 \text{ alemp. yht.} \end{cases}$$

$$-3 + 4 \cdot 1 = 1 \neq 0$$

$t = 1$ ei toteuta alemp. yht., joten suora ei leikkaa y-akselia.