

S 281 Nr. 1

a) $E: 3x_2 + 4x_3 = 0$; $A(3|1|7)$

Erstelle Gerade $g \perp E \wedge A \in g$

$$g: \vec{x} = \begin{pmatrix} 3 \\ -1 \\ 7 \end{pmatrix} + t \begin{pmatrix} 0 \\ 3 \\ 4 \end{pmatrix}$$

$g \cap E = \{F\}$ F ist Lotfußpunkt

$$\begin{aligned} 0 \cdot (3 + 0 \cdot t) + 3(-1 + 3t) + 4(7 + 4t) &= 0 \\ -3 + 9t + 28 + 16t &= 0 \\ 25t &= -25 \\ \underline{\underline{t}} &= \underline{\underline{-1}} \end{aligned}$$

$$\vec{OF} = \begin{pmatrix} 3 \\ -1 \\ 7 \end{pmatrix} - 1 \begin{pmatrix} 0 \\ 3 \\ 4 \end{pmatrix} = \begin{pmatrix} 3 \\ -4 \\ 3 \end{pmatrix} ; \underline{\underline{F(3|-4|3)}}$$

$$\underline{\underline{d}} = |\vec{AF}| = \sqrt{(3-3)^2 + (-4-(-1))^2 + (3-7)^2} = \sqrt{9+16} = \underline{\underline{5}}$$

$$d(B; E) = \underline{\underline{20}} ; d(C; E) = \underline{\underline{5}}$$

b) $E: \left[\vec{x} - \begin{pmatrix} 1 \\ 2,5 \\ 3,5 \end{pmatrix} \right] \cdot \begin{pmatrix} 12 \\ 6 \\ -4 \end{pmatrix} = 0$; $A(-2|0|13)$

E : in Koordinatenform umwandeln

$$E: 12x_1 + 6x_2 - 4x_3 = 13$$

Lotgerade g zu E durch Punkt $A(-2|0|13)$

$$g: \vec{x} = \begin{pmatrix} -2 \\ 0 \\ 3 \end{pmatrix} + t \begin{pmatrix} 12 \\ 6 \\ -4 \end{pmatrix}$$

$$\begin{aligned} g \cap E = \{F\} \quad 12 \cdot (-2 + 12t) + 6 \cdot (0 + 6t) - 4(3 - 4t) &= 13 \\ -24 + 144t + 36t - 12 + 16t &= 13 \\ 196t &= 49 \end{aligned}$$

$$\underline{\underline{t}} = \underline{\underline{\frac{49}{196} = \frac{1}{4}}}$$

$$\vec{OF} = \begin{pmatrix} -2 \\ 0 \\ 3 \end{pmatrix} + \frac{1}{4} \begin{pmatrix} 12 \\ 6 \\ -4 \end{pmatrix} = \begin{pmatrix} 1 \\ 1,5 \\ 2 \end{pmatrix} ; F(1|1,5|2)$$

$$\underline{\underline{d}} = |\vec{AF}| = \sqrt{3^2 + 1,5^2 + (-1)^2} = \underline{\underline{3,5}} ; d(B; E) = \underline{\underline{14}} ; d(C; E) = \underline{\underline{\frac{293}{7}}}$$