

Nr. 1) a) $P(1|2|2)$ $Z(3|4|-2)$; $\vec{OP}' = \vec{OZ} + \vec{PZ}$

$$\vec{OP}' = \begin{pmatrix} 3 \\ 4 \\ -2 \end{pmatrix} + \begin{pmatrix} 3-1 \\ 4-2 \\ -2-2 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \\ -2 \end{pmatrix} + \begin{pmatrix} 2 \\ 2 \\ -4 \end{pmatrix} = \begin{pmatrix} 5 \\ 6 \\ -6 \end{pmatrix}; \underline{P'(5|6|-6)}$$

b) $P'(2|1|8)$ $Z(4|2|3)$; $\vec{OP} = \vec{OZ} + \vec{P'Z}$

$$\vec{OP} = \begin{pmatrix} 4 \\ 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 4-2 \\ 2-1 \\ 3-8 \end{pmatrix} = \begin{pmatrix} 4 \\ 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ 1 \\ -5 \end{pmatrix} = \begin{pmatrix} 6 \\ 3 \\ -2 \end{pmatrix}; \underline{P(6|3|-2)}$$

c) $P(1|4|5)$ $P'(4|4|9)$ Z ist der Mittelpunkt der Strecke $\overline{PP'}$

$$\vec{OZ} = \frac{1}{2} (\vec{OP} + \vec{OP}') = \frac{1}{2} \begin{pmatrix} 1+4 \\ 4+4 \\ 5+9 \end{pmatrix} = \frac{1}{2} \begin{pmatrix} 5 \\ 8 \\ 14 \end{pmatrix} \Rightarrow \underline{Z(2,5|4|7)}$$

Nr. 2) E: $2x_1 + 3x_2 - 5x_3 = 10$; A(3|4|-6)

a) $g: \vec{x} = \begin{pmatrix} 3 \\ 4 \\ -6 \end{pmatrix} + t \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix}$; $g \cap E = \{F\}$

$$2 \cdot (3 + 2t) + 3 \cdot (4 + 3t) - 5(-6 - 5t) = 10$$

$$6 + 4t + 12 + 9t + 30 + 25t = 10$$

$$48 + 38t = 10 \quad | -48$$

$$38t = -38$$

$$t = -1 \Rightarrow t_A = 2 \cdot (-1) = -2$$

$$\vec{OA}' = \begin{pmatrix} 3 \\ 4 \\ -6 \end{pmatrix} - 2 \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix} = \begin{pmatrix} -1 \\ -2 \\ +4 \end{pmatrix} \Rightarrow \underline{A'(-1|-2|4)}$$

b) A(6|8|-10) $g: \vec{x} = \begin{pmatrix} 6 \\ 8 \\ -10 \end{pmatrix} + t \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix}$; $g \cap E = \{F\}$

$$2 \cdot (6 + 2t) + 3(8 + 3t) - 5(-10 - 5t) = 10$$

$$12 + 4t + 24 + 9t + 50 + 25t = 10$$

$$86 + 38t = 10$$

$$t = \frac{-76}{38} = -2 \Rightarrow t_A = 2 \cdot (-2) = -4$$

$$\vec{OA}' = \begin{pmatrix} 6 \\ 8 \\ -10 \end{pmatrix} - 4 \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix} = \begin{pmatrix} -2 \\ -4 \\ 10 \end{pmatrix} \Rightarrow \underline{A'(-2|-4|10)}$$

c) $\underline{A'(5|8|-18)}$