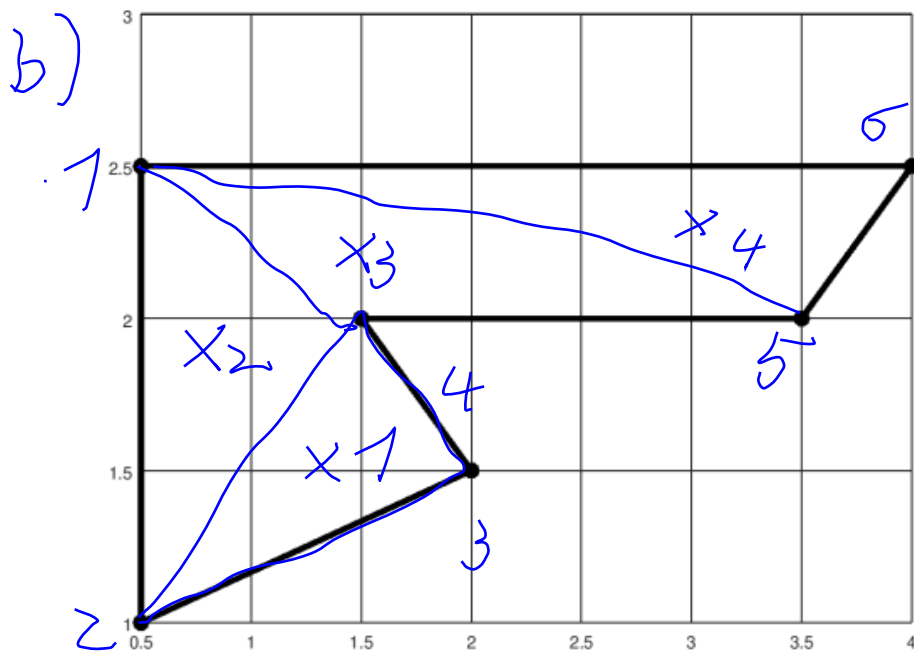


$$\begin{aligned}
 a) \quad |T| &= |(P6 - P3) \times (P6 - P1)| \cdot \frac{1}{2} \\
 &= \frac{1}{2} \cdot \left| \begin{pmatrix} 2 \\ 1 \end{pmatrix} \times \begin{pmatrix} 3.5 \\ 0 \end{pmatrix} \right| = |0 - 3.5| \cdot \frac{1}{2} \\
 &= \frac{3.5}{2}
 \end{aligned}$$



$$X_1 = (P3 - P2) \times P4 - P1$$

$$|T| = \frac{1}{2} \cdot |X_1 + X_2 + X_3 + X_4|$$

$$= \left(\left| \begin{pmatrix} 1,5 \\ 0,5 \end{pmatrix} \times \begin{pmatrix} 1 \\ 1 \end{pmatrix} \right| + \left| \begin{pmatrix} 1 \\ 1 \end{pmatrix} \times \begin{pmatrix} 1 \\ -0,5 \end{pmatrix} \right| + \left| \begin{pmatrix} 1 \\ -0,5 \end{pmatrix} \times \begin{pmatrix} 3 \\ -0,5 \end{pmatrix} \right| + \left| \begin{pmatrix} 3 \\ -0,5 \end{pmatrix} \times \begin{pmatrix} 0,5 \\ 0,5 \end{pmatrix} \right| \right) \cdot \frac{1}{2}$$

$$= (|1| + |(-1,5)| + |1| + |1,75|) \cdot \frac{1}{2}$$

$$= (5,25) \cdot \frac{1}{2} = \frac{5,25}{2}$$

2)

$$E = 0$$

a)

	t	s	
1	0	1	0 → s = -1
1	2	0	0 → t = -0,5
1	-1	-1	0

$$1 + 0,5 + 1 = 0 \quad \text{Nein} \rightarrow$$

b)

	t	s	
1	0	1	3 → s = 2
1	2	0	-1 → t = -1
1	-1	-1	0

$$1 + 1 - 2 = 0 \quad \checkmark$$

c)

$$n = \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} \times \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$$

$$= \begin{pmatrix} -2 - 0 \\ -1 - 0 \\ 0 - 2 \end{pmatrix} = \begin{pmatrix} -2 \\ -1 \\ -2 \end{pmatrix} \quad n_2 = \underline{\underline{\begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}}}$$

$$\tilde{n} = \frac{n}{|n|}$$

$$|n| = \sqrt{2^2 + 1^2 + 2^2} = \sqrt{9} = 3$$

$$\tilde{n} = \frac{n}{3} = \frac{1}{3} \begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}$$

$$d) -2 \times 1 - x_2 - 2 \times 3 = -5$$

$$3) a) n = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}$$

$$b) \text{Ja, weil } 1 \cdot 0 - 1 \cdot 0 = 0 \checkmark$$

$$c) 0 \cdot 1 + 1 \cdot 2 - 1 \cdot 3 = 0$$

$$2 - 3 = 0 \downarrow$$

d)

4)

$$5) p(x) = \frac{\left\langle \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \right\rangle}{\left\| \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \right\|^2} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$= (1 \cdot 1 + 2 \cdot 1 - 1 \cdot 1) \cdot \frac{\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}}{\left(\sqrt{1^2 + 1^2 + 1^2} \right)^2}$$

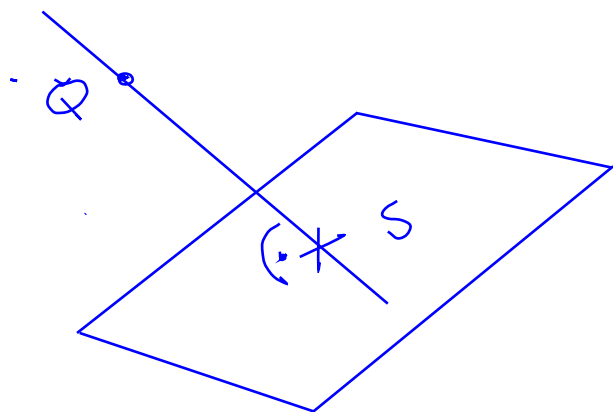
$$= \frac{2}{3} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$b) p(x) = \frac{\left\langle \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \right\rangle}{\left\| \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \right\|^2} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} + \frac{\left\langle \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} \right\rangle}{\left\| \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} \right\|^2} \cdot \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$$

$$= \frac{2}{3} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} + \frac{(1 + 0 - 1)}{\left(\sqrt{1 + 1} \right)^2} \cdot \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} = \frac{2}{3} \cdot \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} + \frac{2}{2} \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$$

c)

6)



$$\begin{pmatrix} 2 \\ 6 \\ 6 \end{pmatrix} + t \begin{pmatrix} 2 \\ -3 \\ 6 \end{pmatrix}$$