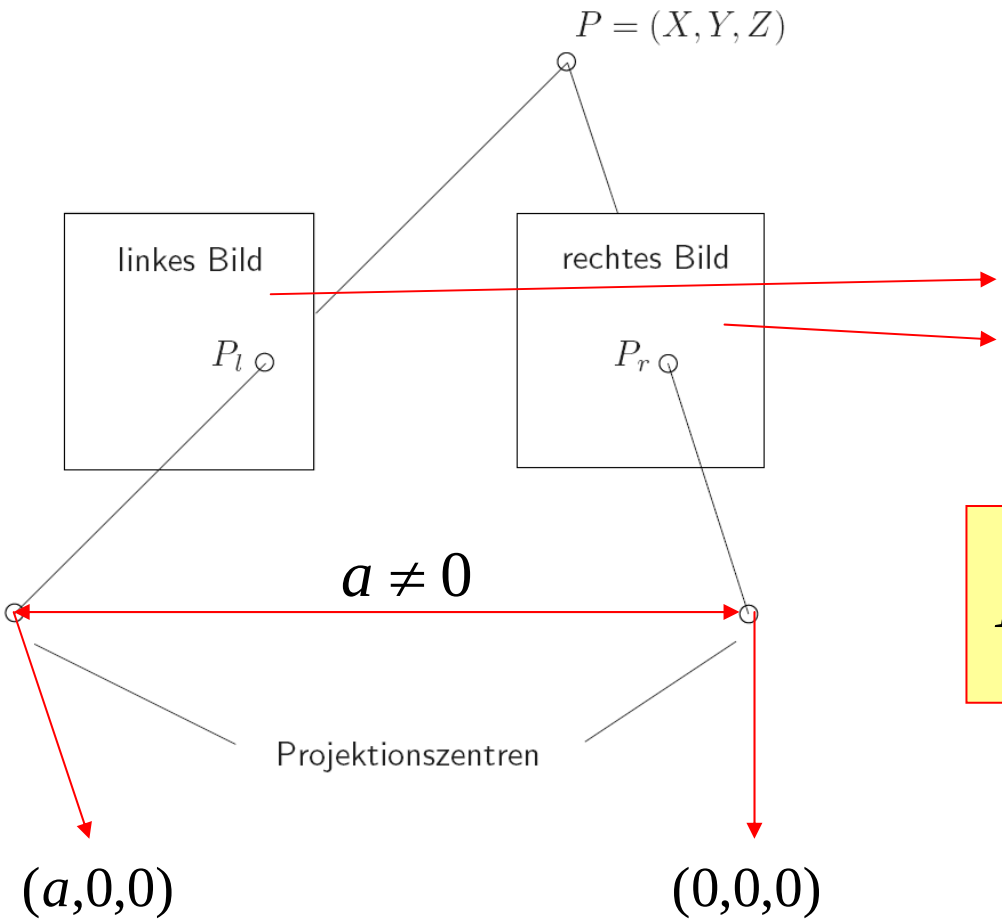
7.6 Shape from Stereo

Standardstereogeometrie



$$P_l, P_r \Rightarrow P = (x, y, z)$$

Aufgabe 1

Zeige:

$$x_l = a + \frac{f}{z}(x - a) \qquad y_l = \frac{f \cdot y}{z}$$

Aufgabe 1

$$g: \begin{pmatrix} a \\ 0 \\ 0 \end{pmatrix} + \lambda \cdot \begin{pmatrix} x-a \\ y \\ z \end{pmatrix}$$

Gerade durch *P=(x,y,z)* und Projektionszentrum

$$(a,0,0)$$

Schnittpunkt mit Bildebene *z=f*

$$\lambda z = f \qquad \lambda = \frac{f}{z}$$

$$x_l = a + \frac{f}{z}(x-a) \qquad y_l = \frac{f \cdot y}{z}$$

Aufgabe 2

Die Spezialfälle $x=0$ und $x=a$.

Aufgabe 2

$$x_r = \frac{f \cdot x}{z} \qquad x_l = a + \frac{f}{z}(x - a)$$

$$y_r = \frac{f \cdot y}{z} \qquad y_l = \frac{f \cdot y}{z}$$

$$x = 0$$

$$x_l = a - \frac{af}{z} \qquad z = \frac{af}{a - x_l} \qquad y = \frac{ay_l}{a - x_l}$$

Aufgabe 2

$$x_r = \frac{f \cdot x}{z} \qquad x_l = a + \frac{f}{z}(x - a)$$

$$y_r = \frac{f \cdot y}{z} \qquad y_l = \frac{f \cdot y}{z}$$

$$x = a$$

$$z = \frac{af}{x_r} \qquad y = \frac{ay_l}{x_r}$$

Aufgabe 3

Zeigen Sie:

$$x_r - x_l + a \neq 0$$

Aufgabe 3

$$x_r = \frac{f \cdot x}{z} \qquad x_l = a + \frac{f}{z}(x - a)$$

$$x_r - x_l + a = \frac{f \cdot a}{z} = 0 \quad \Rightarrow \quad a = 0$$

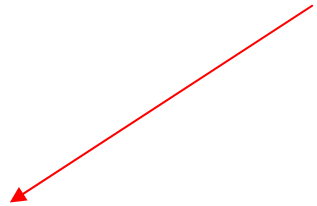
Widerspruch

Aufgabe 4

Linkes Projektionszentrum im Punkt: $(a,b,0) \quad a,b \neq 0$

Zeigen Sie:

$$z = \frac{f \cdot a}{x_r - x_l + a} = \frac{f \cdot b}{y_r - y_l + b}$$



Fehler im Buch

Aufgabe 4

$$g: \begin{pmatrix} a \\ b \\ 0 \end{pmatrix} + \lambda \cdot \begin{pmatrix} x-a \\ y-b \\ z \end{pmatrix}$$

Gerade durch *P=(x,y,z)* und Projektionszentrum

Schnittpunkt mit Bildebene *z=f*

$$\lambda z = f \qquad \lambda = \frac{f}{z}$$

$$x_l = a + \frac{f}{z}(x-a) \qquad y_l = b + \frac{f}{z}(y-b)$$

$$x_r = \frac{f \cdot x}{z} \qquad y_r = \frac{f \cdot y}{z}$$

Aufgabe 4

$$x_l = a + \frac{f}{z}(x - a)$$

$$x_r = \frac{f \cdot x}{z}$$

$$x = \frac{a \cdot x_r}{x_r - x_l + a}$$

$$z = \frac{a \cdot f}{x_r - x_l + a}$$

$$y_l = b + \frac{f}{z}(y - b)$$

$$y_r = \frac{f \cdot y}{z}$$

$$y = \frac{b \cdot y_r}{y_r - y_l + b}$$

$$z = \frac{b \cdot f}{y_r - y_l + b}$$

7.7 Shape from shading

Aufgabe 2

Dieses Bild kann durch Beleuchtung verschiedener Oberflächen entstehen.

$$\vec{l} = \begin{pmatrix} 0 & 0 & -1 \end{pmatrix}$$

$$z = x \cdot y$$

$$z = \frac{1}{2}(x^2 + y^2)$$

$$z = \frac{1}{2}(x^2 - y^2)$$

Zeigen Sie:

$$L = c_d I_0 \frac{1}{\sqrt{x^2 + y^2 + 1}}$$

Aufgabe 2

$$z = xy \qquad \vec{n} = \frac{1}{\sqrt{x^2 + y^2 + 1}} \begin{pmatrix} y & x & -1 \end{pmatrix}^T$$

$$z = \frac{1}{2}(x^2 + y^2) \qquad \vec{n} = \frac{1}{\sqrt{x^2 + y^2 + 1}} \begin{pmatrix} x & y & -1 \end{pmatrix}^T$$

$$z = \frac{1}{2}(x^2 - y^2) \qquad \vec{n} = \frac{1}{\sqrt{x^2 + y^2 + 1}} \begin{pmatrix} x & -y & -1 \end{pmatrix}^T$$

Aufgabe 2

$$\vec{n} = \frac{1}{\sqrt{x^2 + y^2 + 1}} \begin{pmatrix} y & x & -1 \end{pmatrix}^T$$

$$\vec{n} = \frac{1}{\sqrt{x^2 + y^2 + 1}} \begin{pmatrix} x & y & -1 \end{pmatrix}^T$$

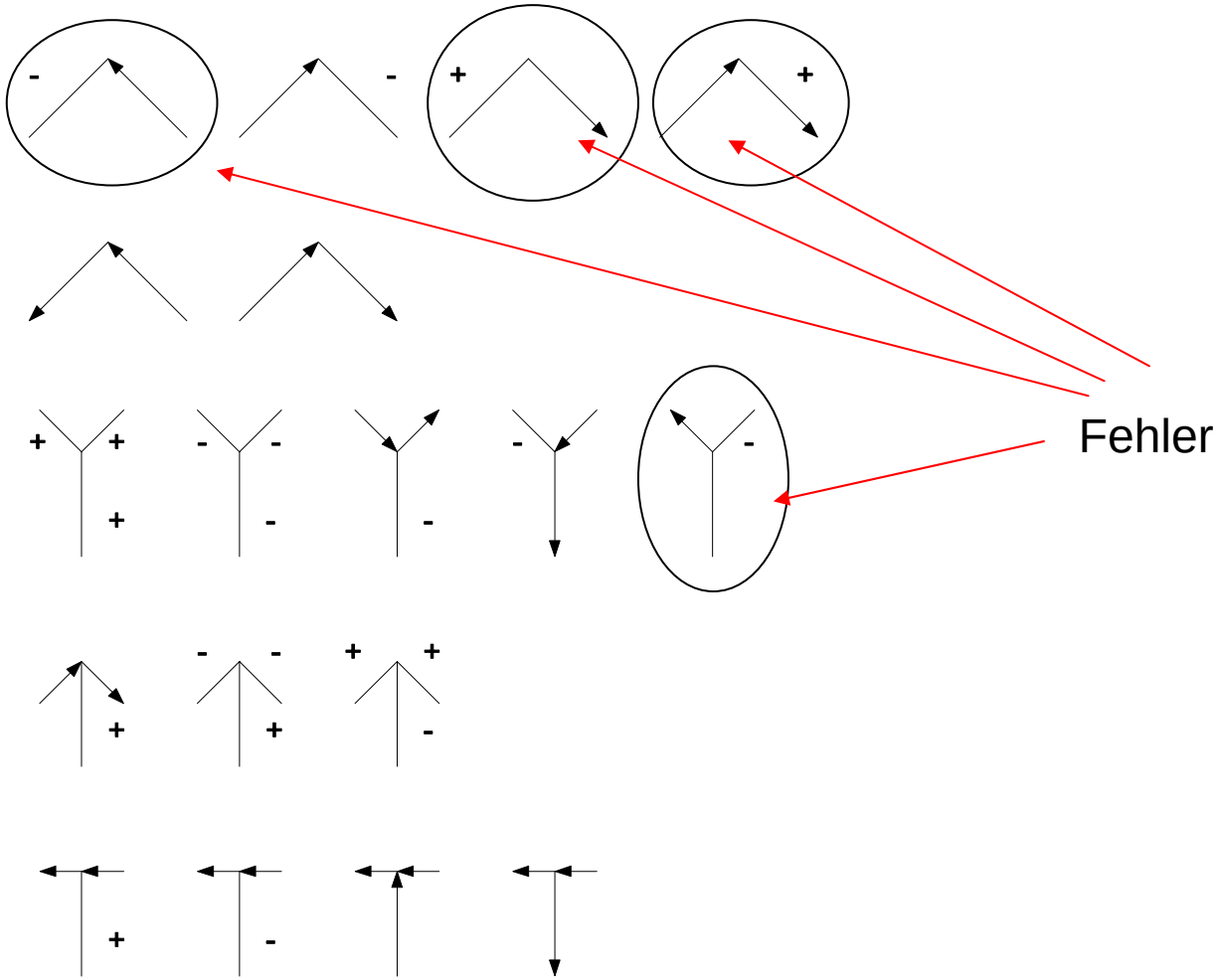
$$\vec{n} = \frac{1}{\sqrt{x^2 + y^2 + 1}} \begin{pmatrix} x & -y & -1 \end{pmatrix}^T$$

$$\vec{l} = \begin{pmatrix} 0 & 0 & -1 \end{pmatrix}$$

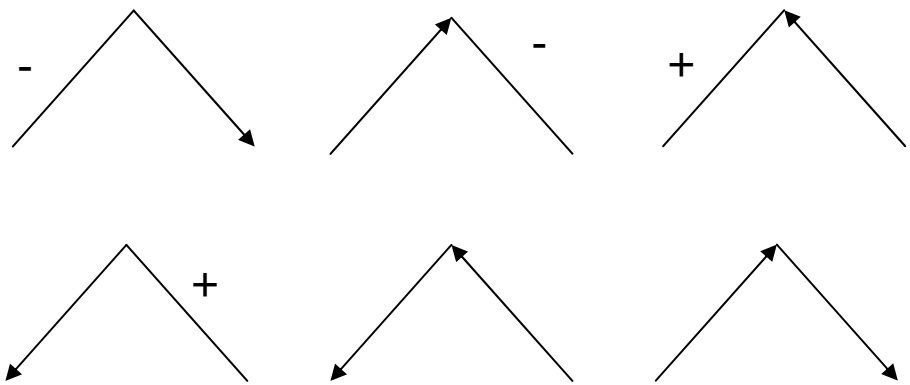
$$L = c_d \cdot I_0 \cdot \frac{1}{\sqrt{x^2 + y^2 + 1}}$$

7.8 Shape from contour

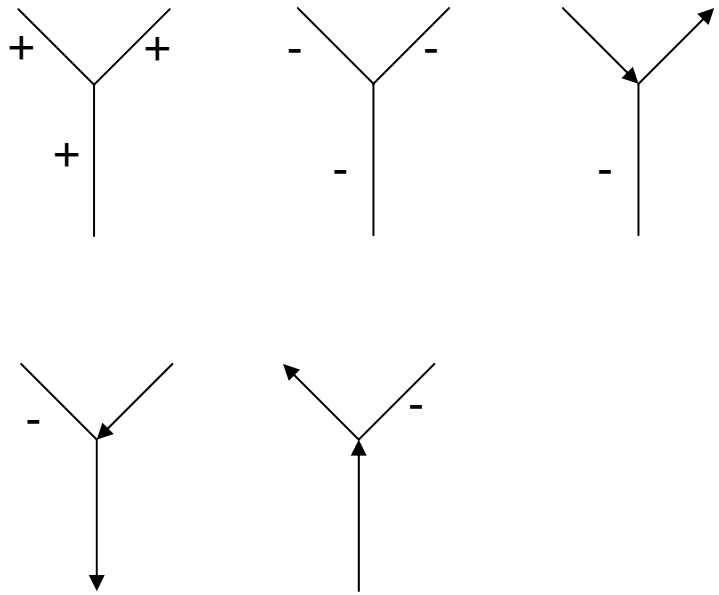
Fehler im Buch



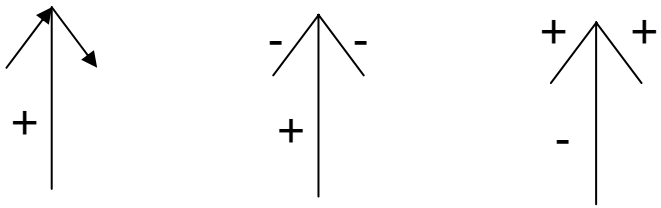
L



Gabel

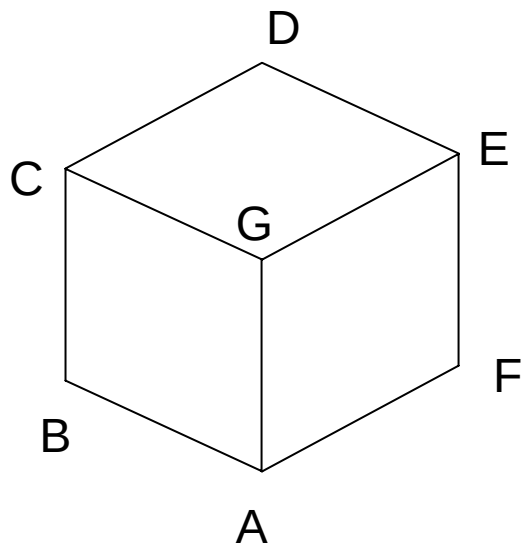


Pfeil



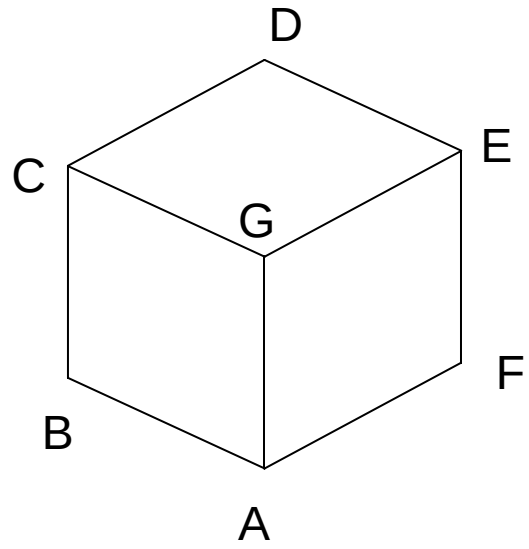
T

Aufgabe 1

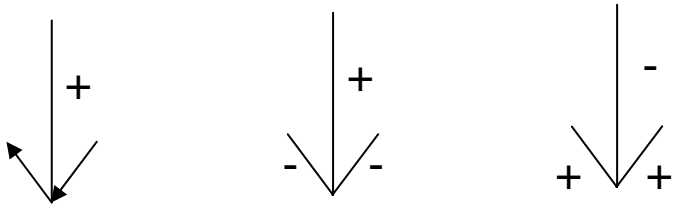


nicht frei im Raum aufgehängt

L=(A,B,C,D,E,F,G)

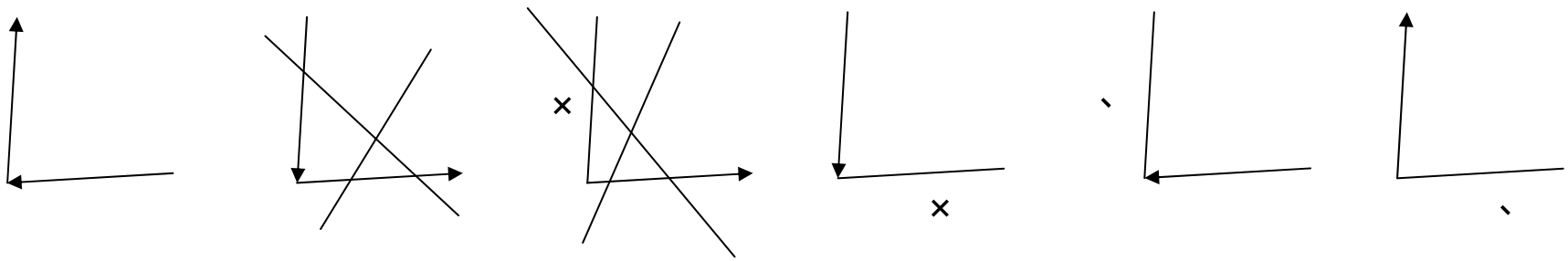


A:



L=(B,C,D,E,F,G)

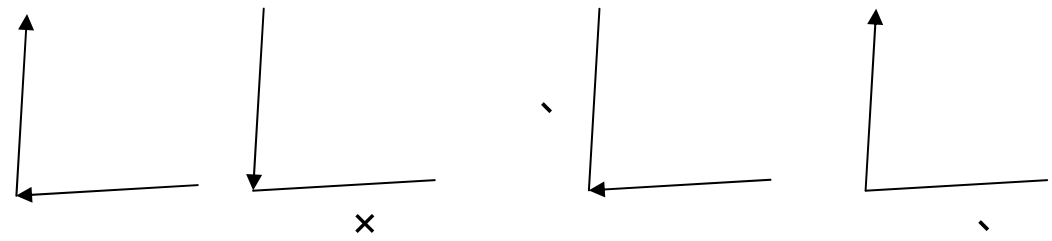
B:

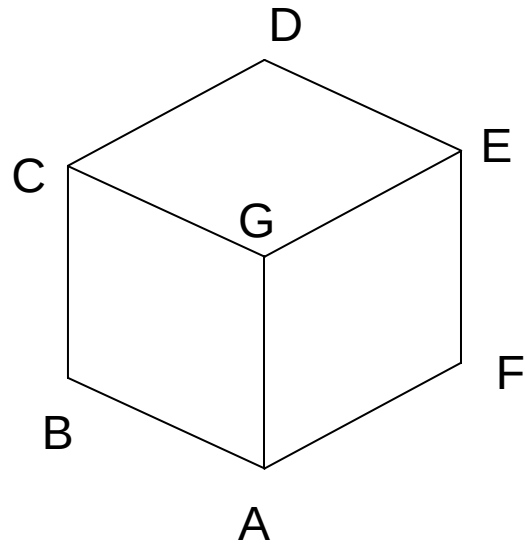


L=(A,C,D,E,F,G)

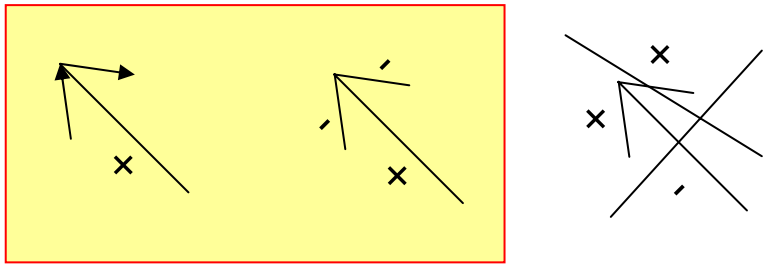
A: keine Änderung L=(C,D,E,F,G)

B:



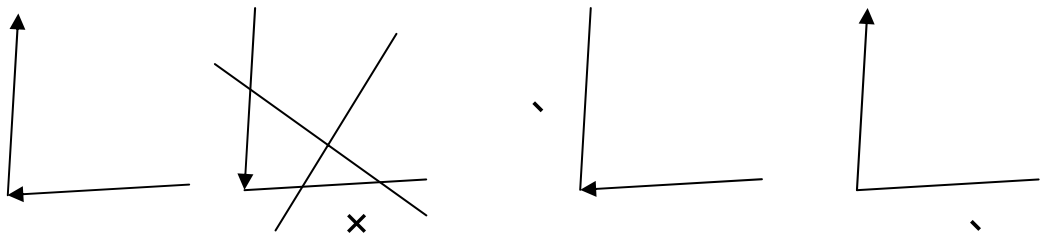


C:



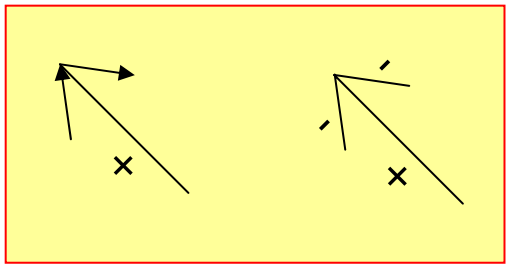
L=(B,D,E,F,G)

B:

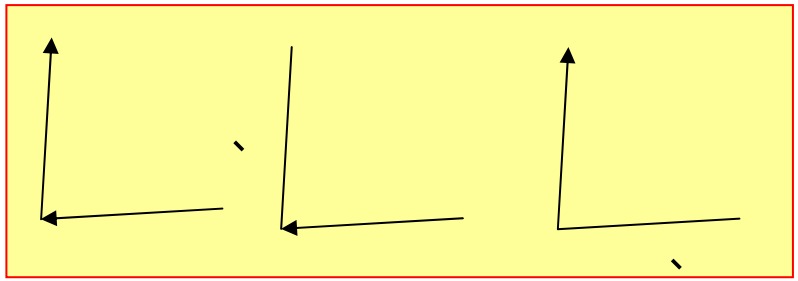


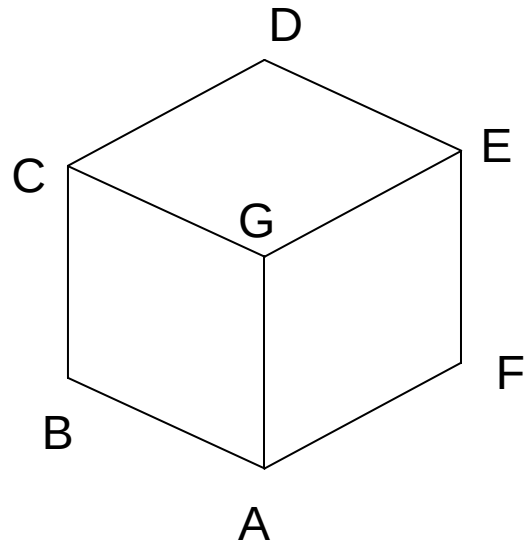
L=(A,C,D,E,F,G)

C:

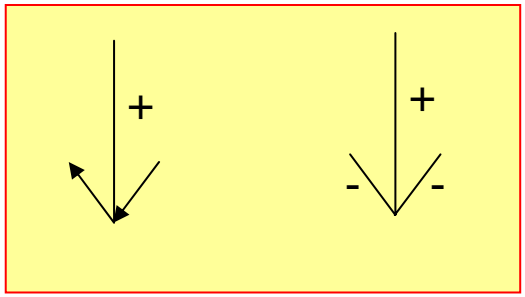


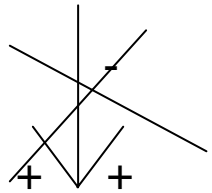
B:





A:



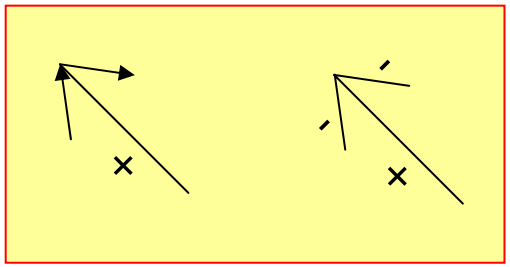


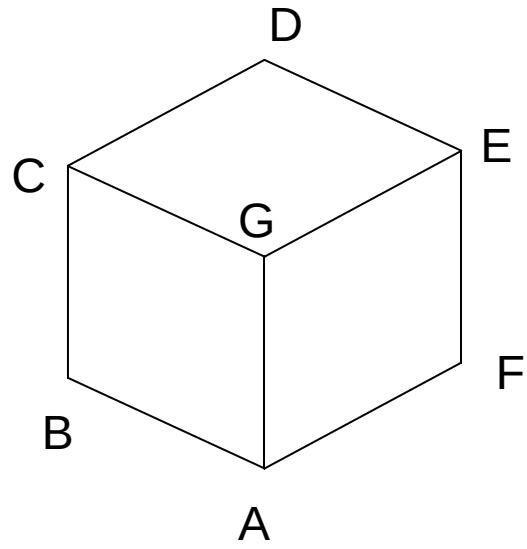
L=(B,C,D,E,F,G)

B: keine Änderung L=(C,D,E,F,G)

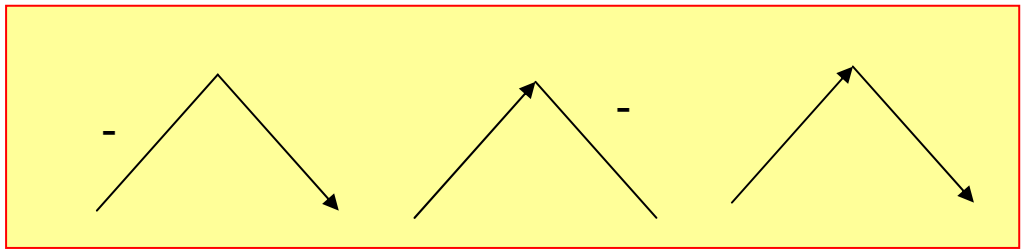
C: keine Änderung L=(D,E,F,G)

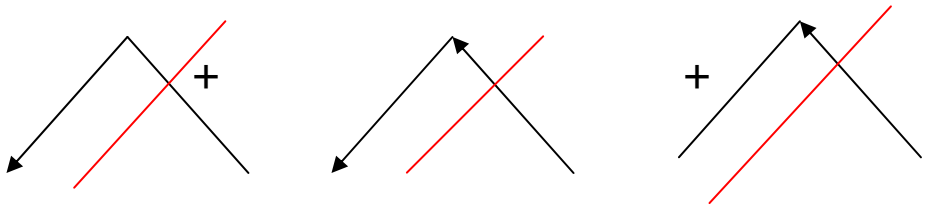
C:





D:

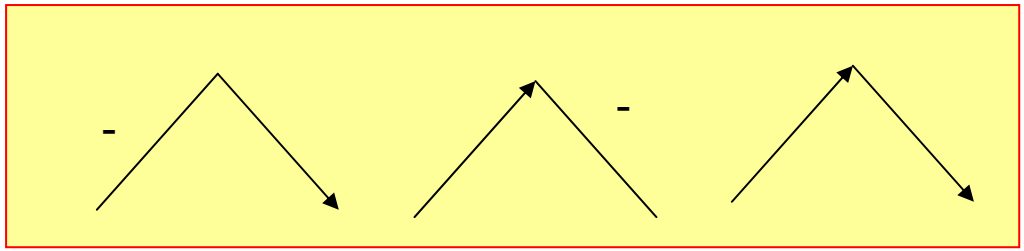


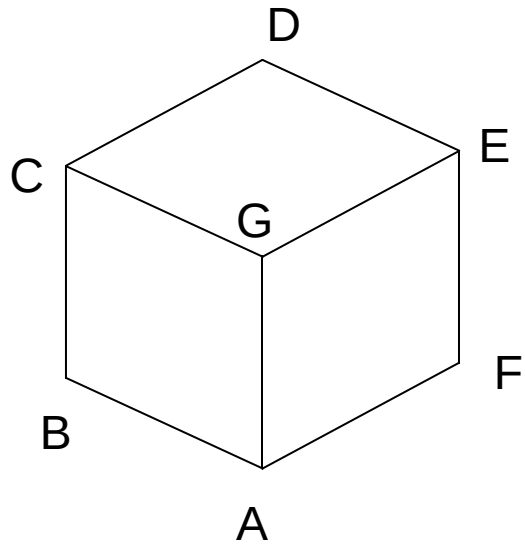


L=(C,E,F,G)

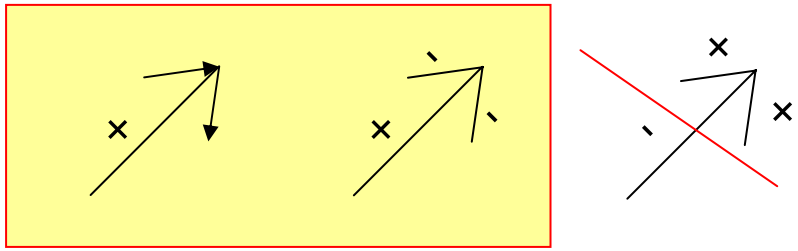
C: keine Änderung L=(E,F,G)

D:



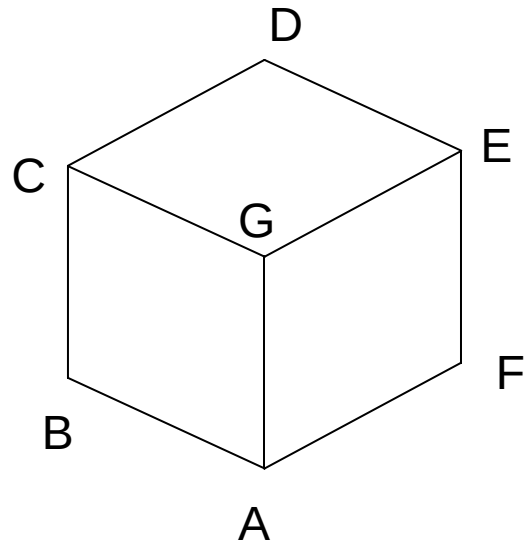


E:

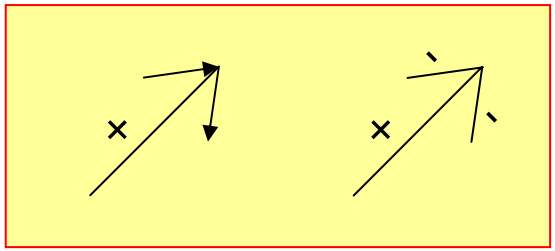


L=(D,F,G)

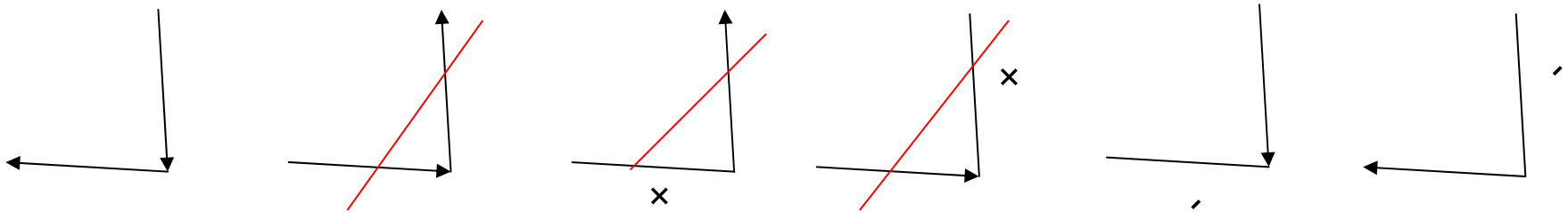
D: keine Änderung L=(F,G)



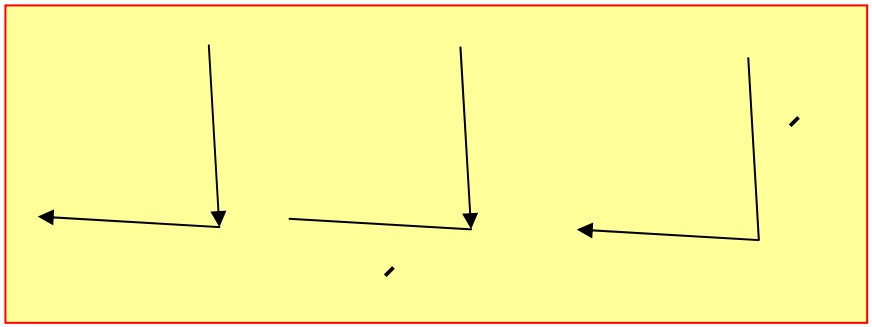
E:



F:



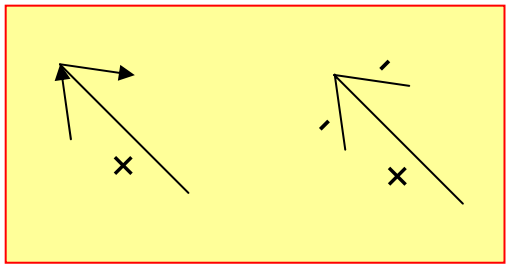
F:



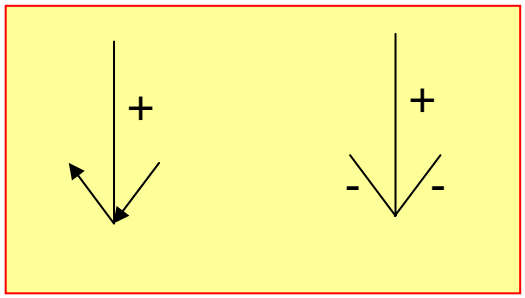
L=(A,E,G)

A:	keine Änderung	L=(E,G)
E:	keine Änderung	L=(G)

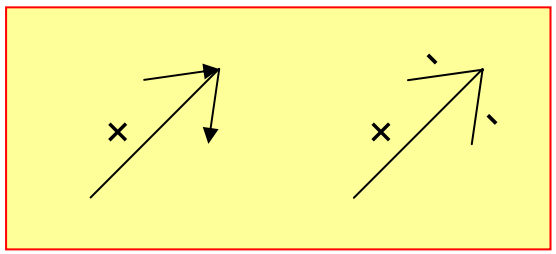
C:

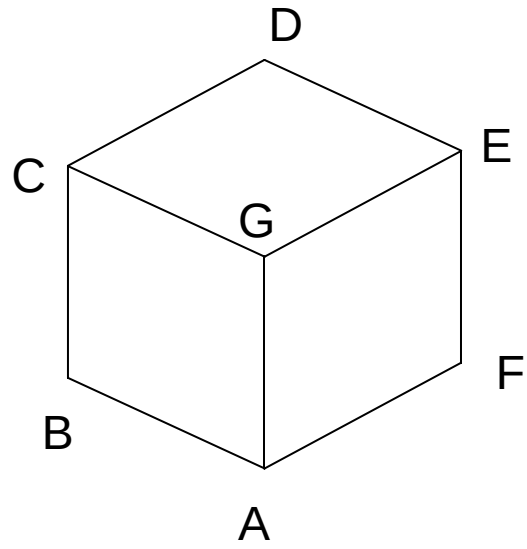


A:

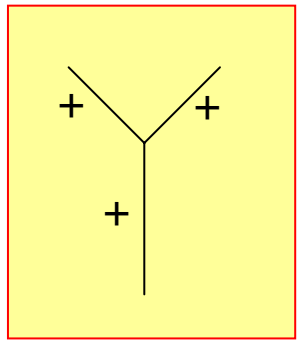


E:





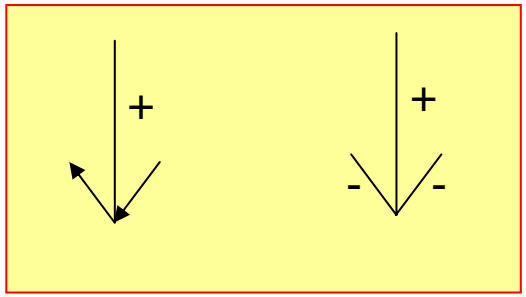
G:



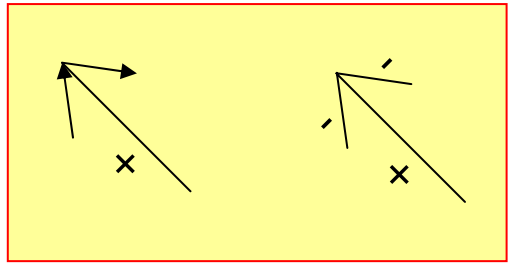
L=(A,C,E)

A:	keine Änderung	L=(C,E)
C:	keine Änderung	L=(E)
E:	keine Änderung	L=(Ø)

A:



C:



D

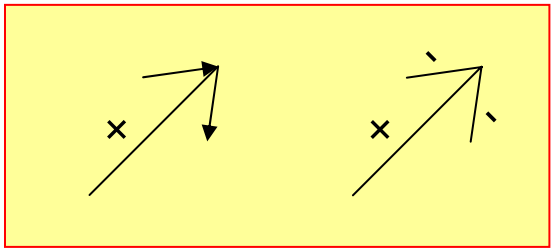
C E

G

F

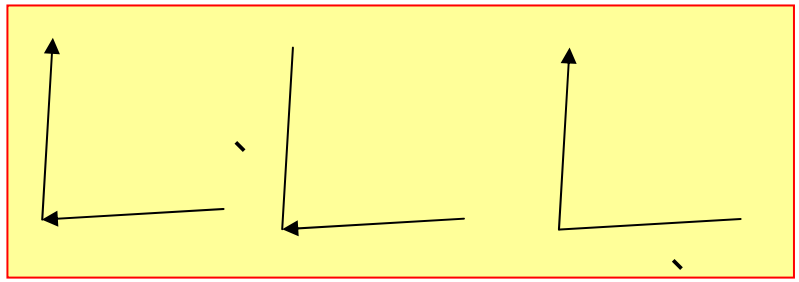
B

E:

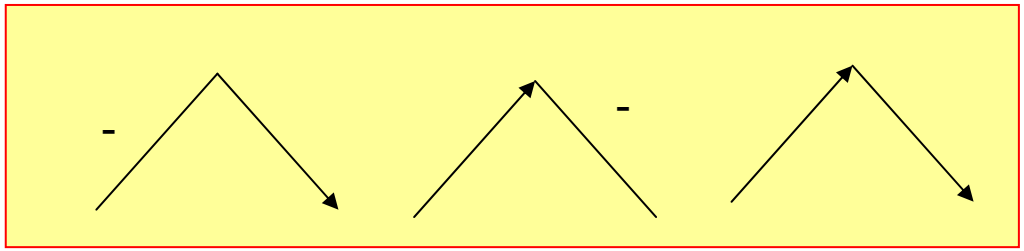


A

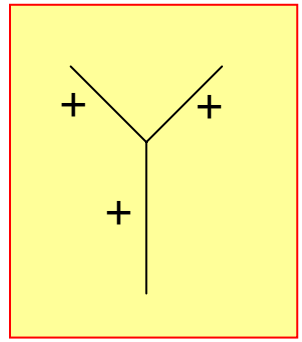
B:



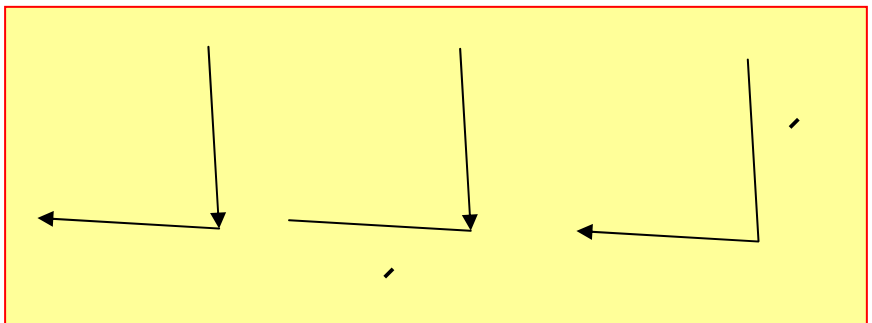
D:

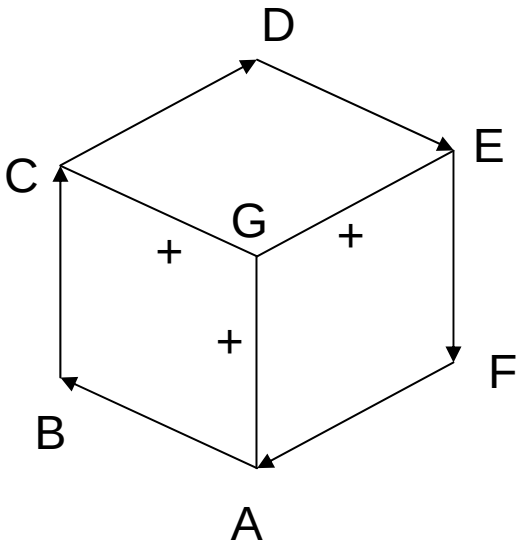


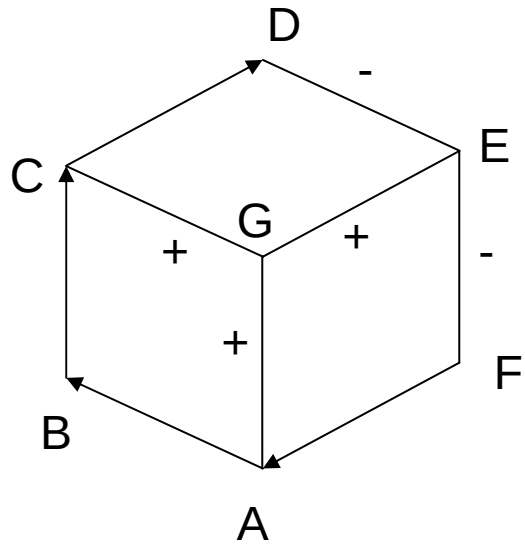
G:

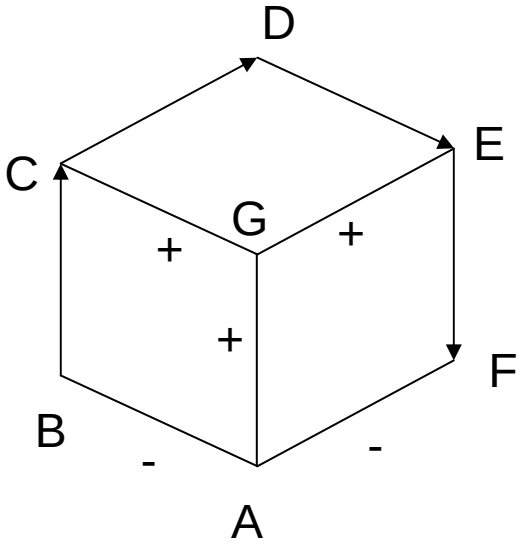


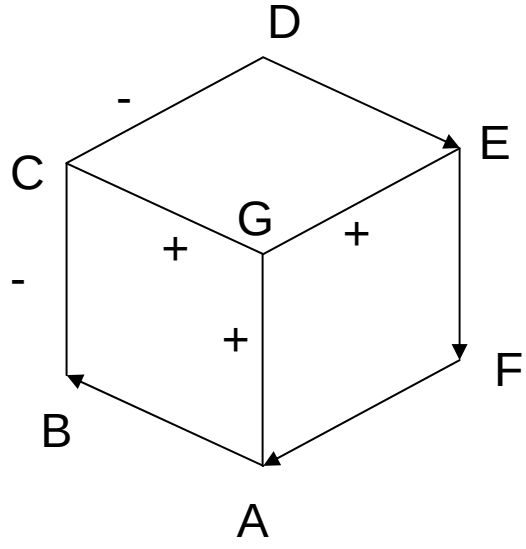
F:

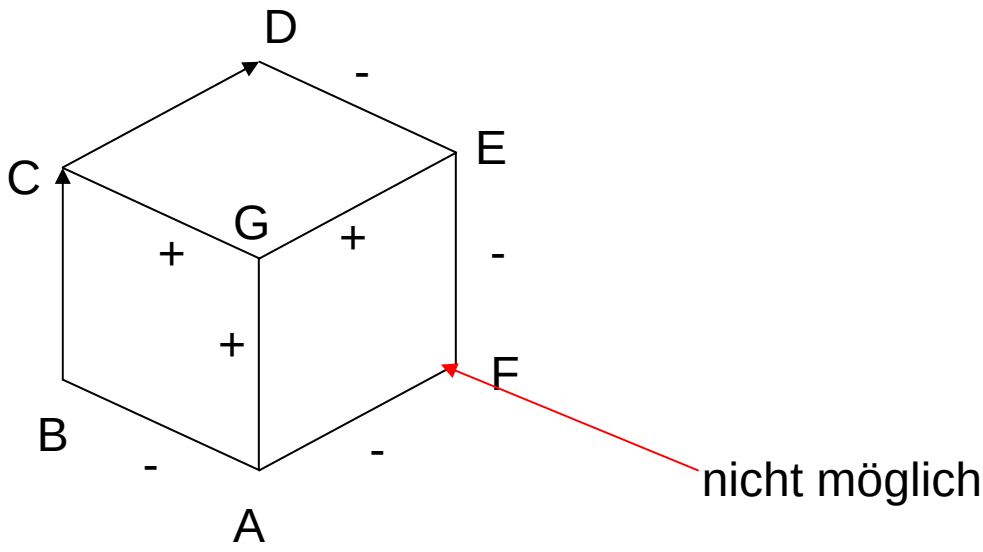



D
C
E
G
+
+
+
F
B
A

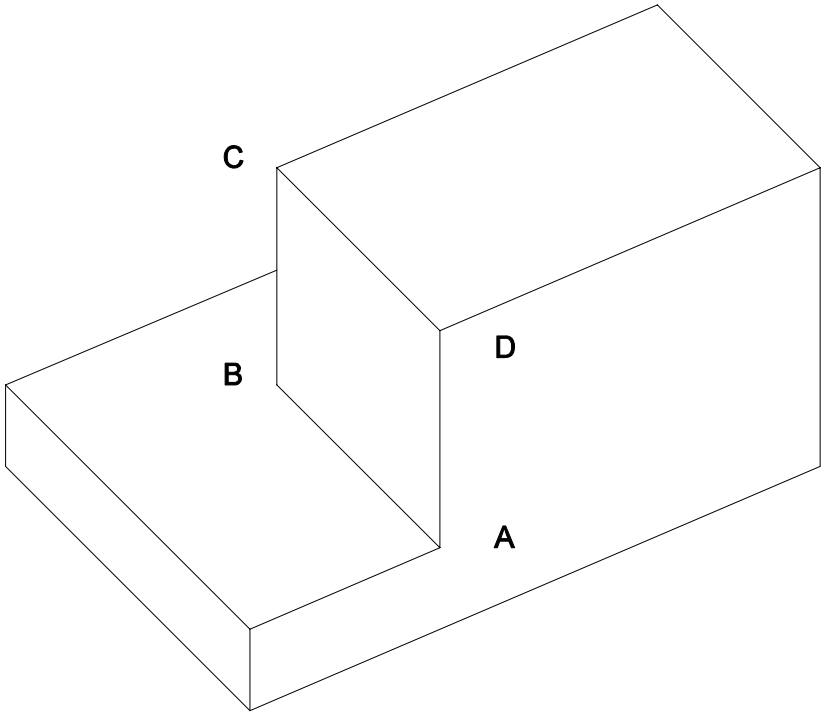

D
-
C
E
G
+
+
-
+
F
B
A


D
C
E
G
+
+
+
F
B
-
-
A


D
-
C
E
G
+
+
-
+
F
B
A


D
-
C
E
G
+
+
-
+
F
B
-
-
A
nicht möglich

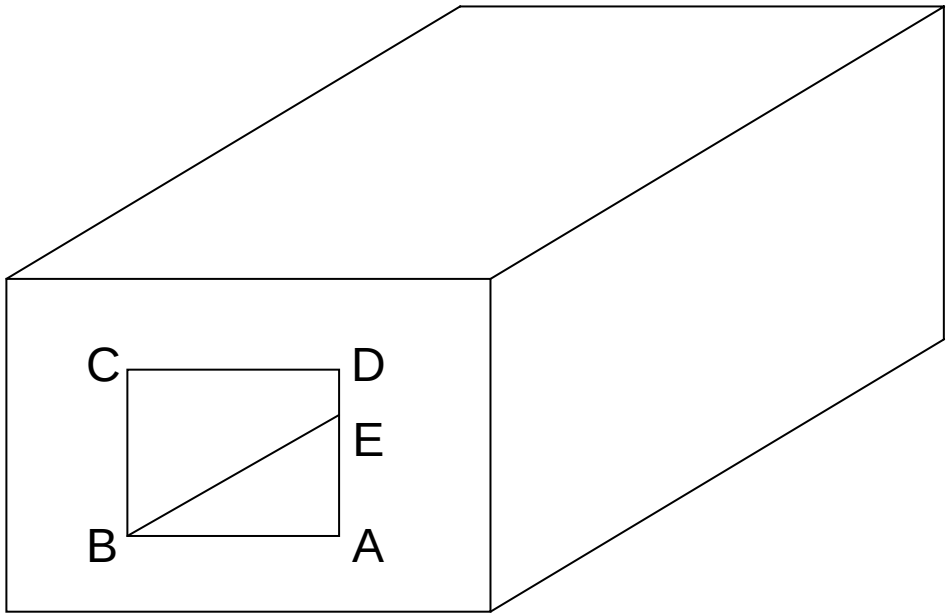
Aufgabe 2



Markierung der Knoten A, B, C, D

siehe Vorlesung

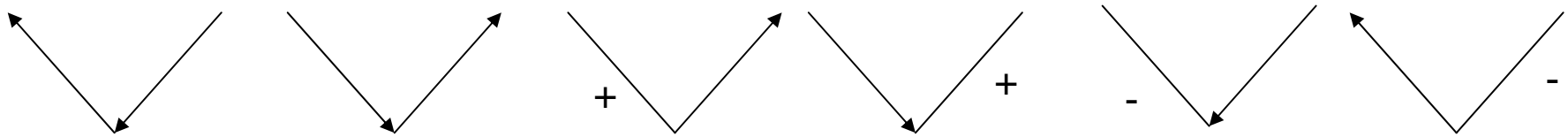
Aufgabe 3



Aufgabe 3

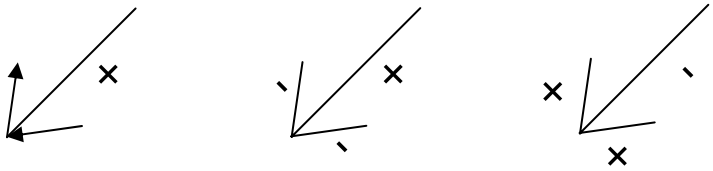
L=(A,B,C,D,E)

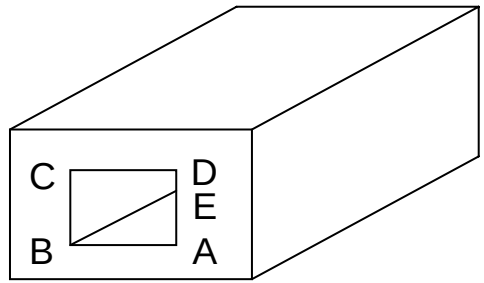
A:



L=(B,C,D,E)

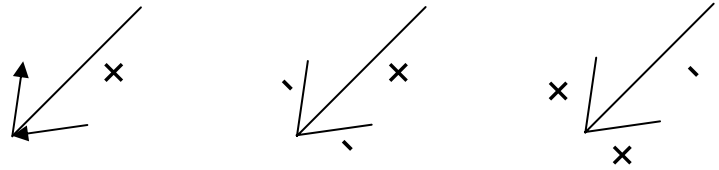
B:

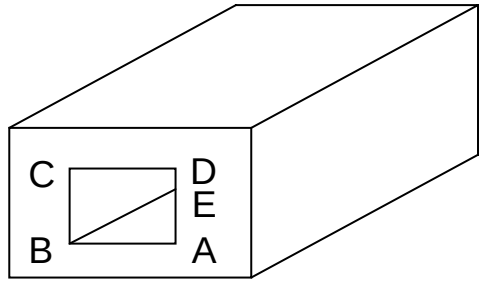




Aufgabe 3

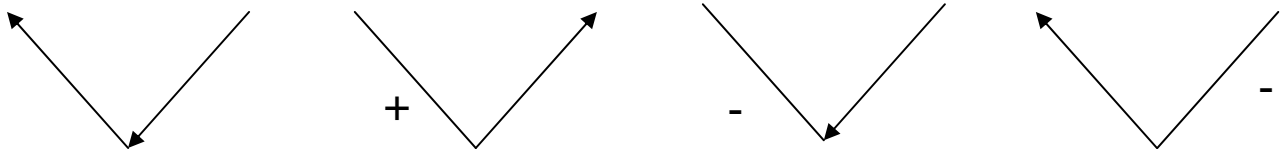
B:





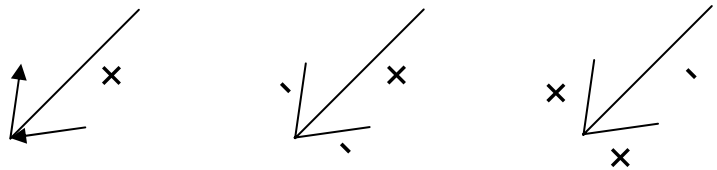
L=(A,C,D,E)

A:



L=(B,C,D,E)

B:

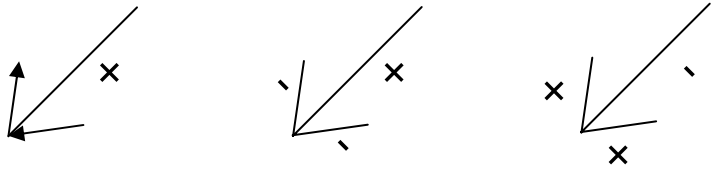


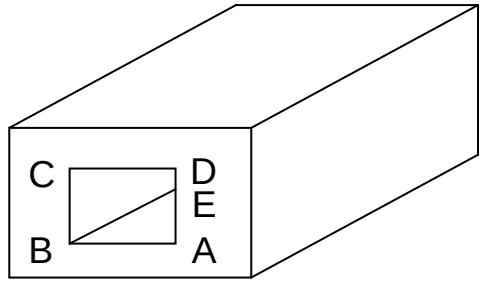
keine Änderung

L=(C,D,E)

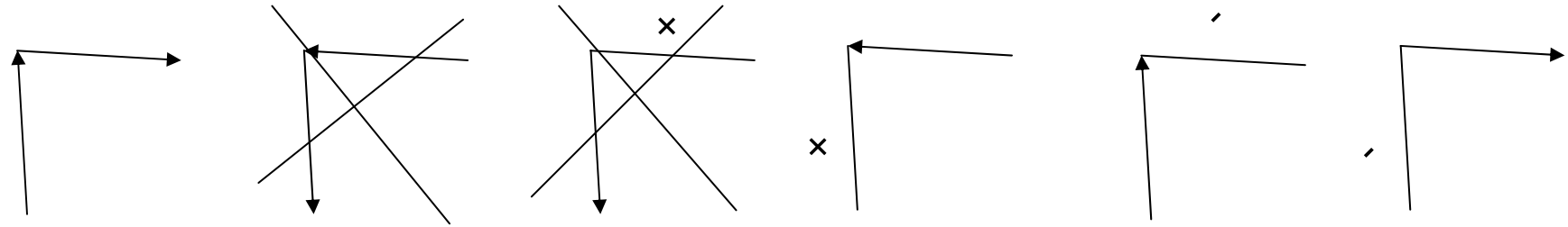
Aufgabe 3

B:



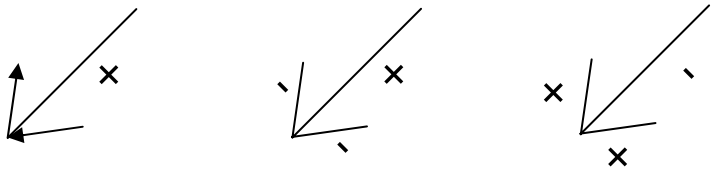


C:



L=(B,D,E)

B:

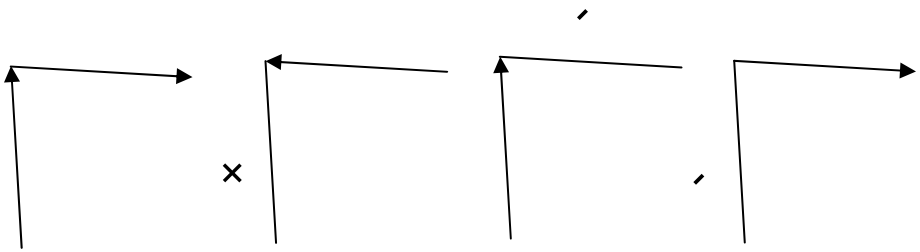


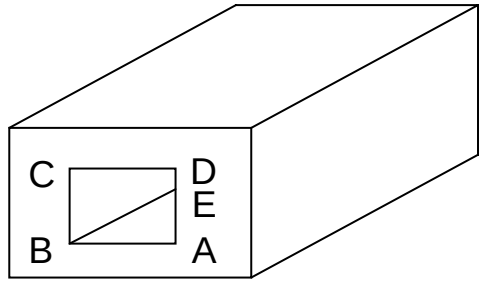
keine Änderung

L=(D,E)

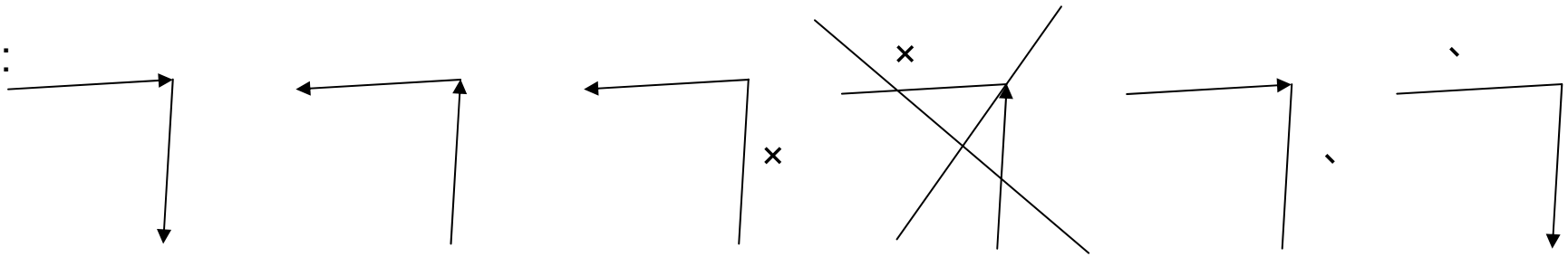
Aufgabe 3

C:



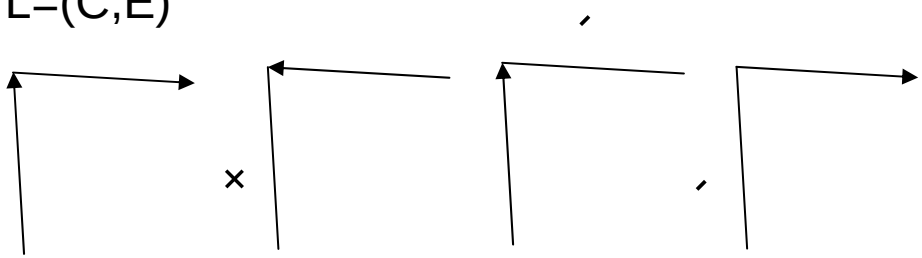


D:



L=(C,E)

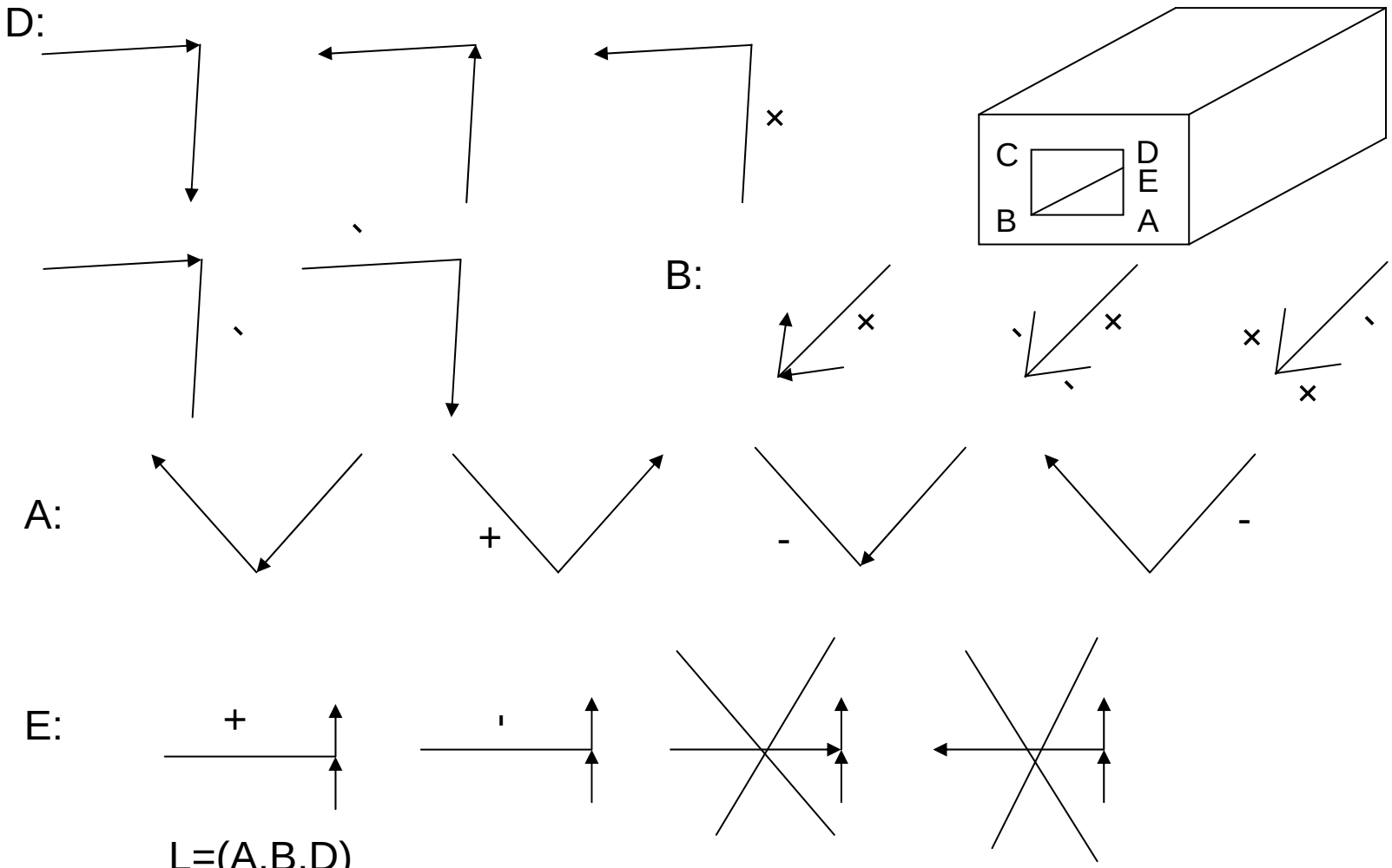
C:



keine Änderung

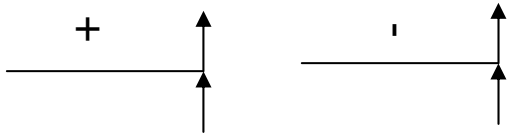
L=(E)

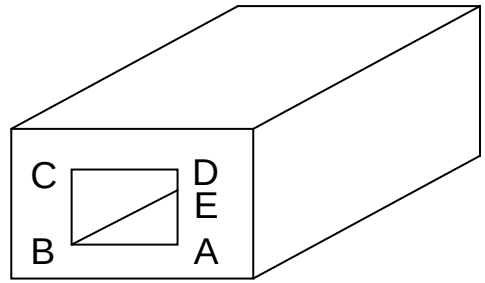
Aufgabe 3



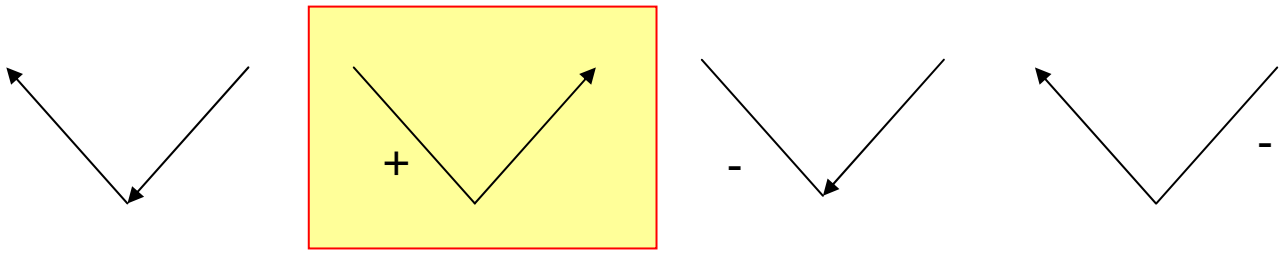
Aufgabe 3

E:





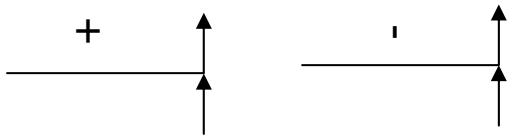
A:



L=(E,B,D)

keine Änderung

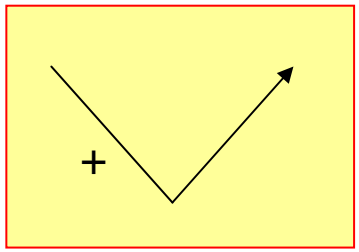
E:

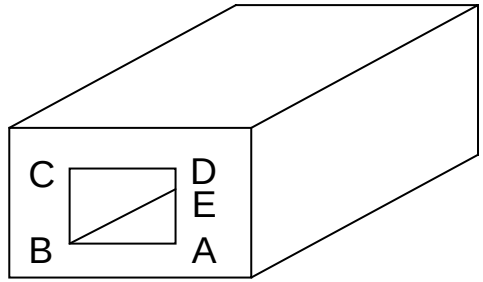


L=(B,D)

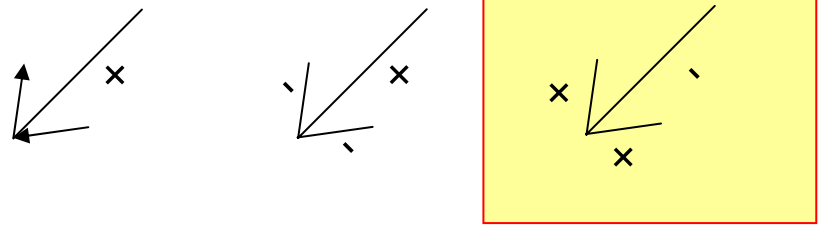
Aufgabe 3

A:





B:

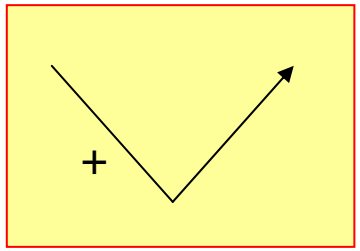


L=(A,C,E,D)

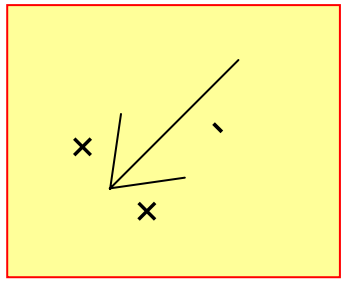
A: keine Änderung L=(C,E,D)

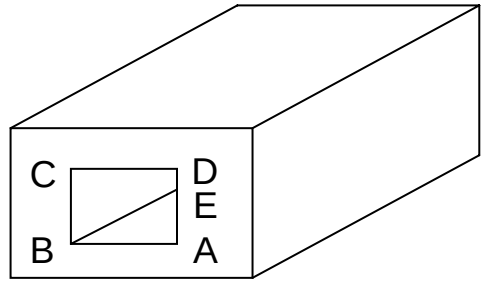
Aufgabe 3

A:

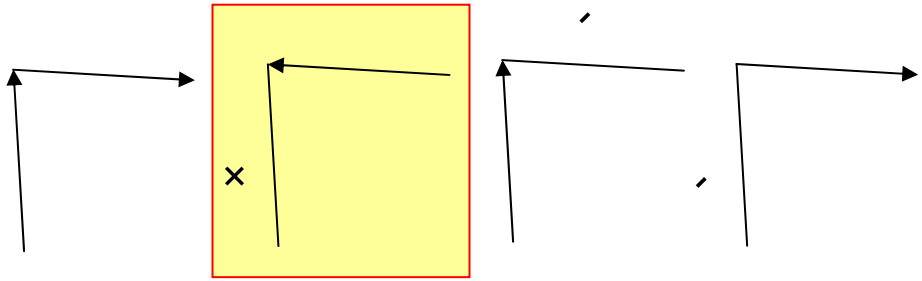


B:





C:

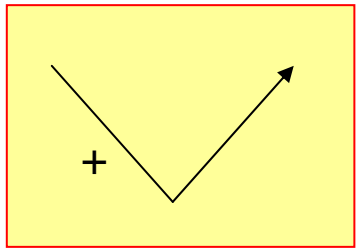


L=(B,E,D)

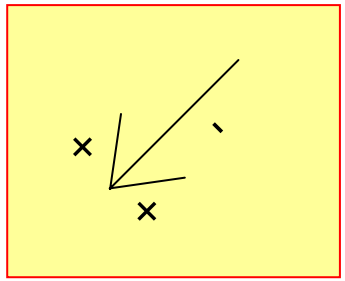
B: keine Änderung L=(E,D)

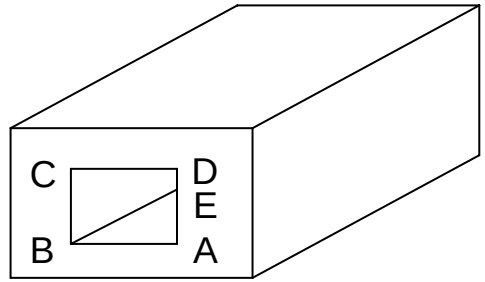
Aufgabe 3

A:

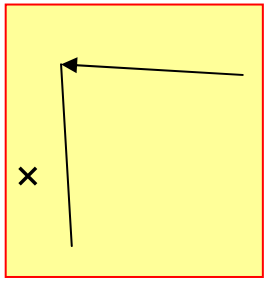


B:

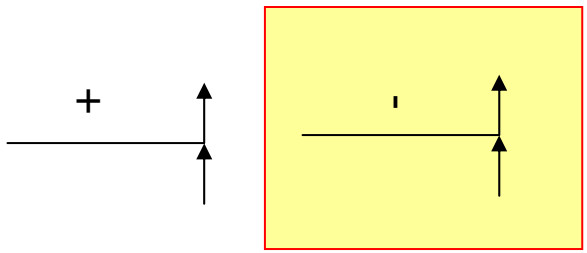




C:



E:



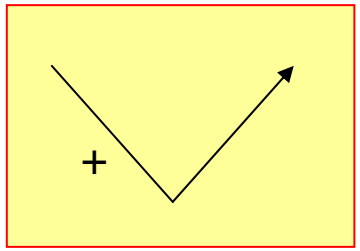
L=(A,B,D)

A: keine Änderung L=(B,D)

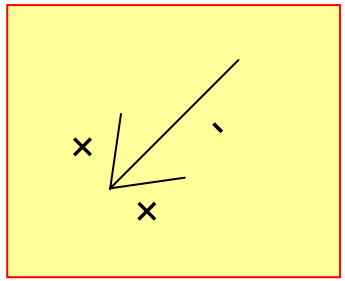
B: keine Änderung L=(D)

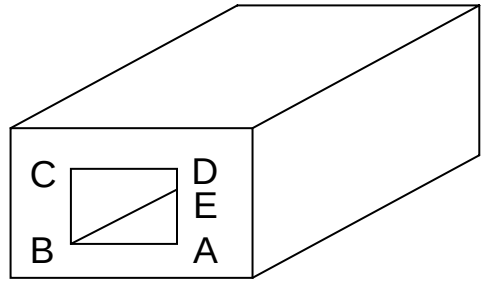
Aufgabe 3

A:

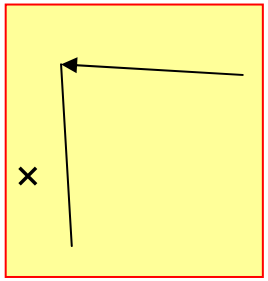


B:

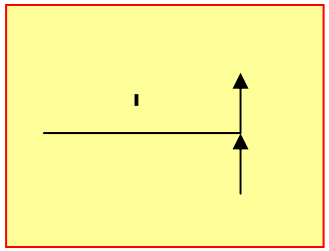




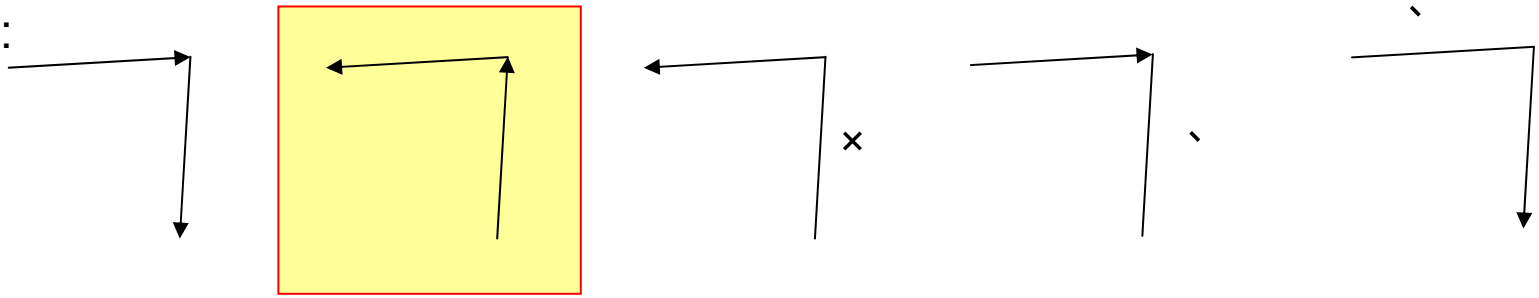
C:



E:



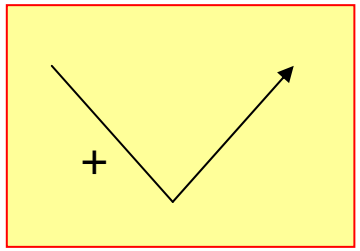
D:



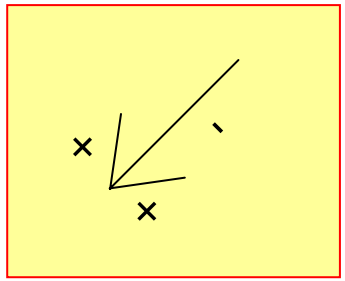
L=(C,E)

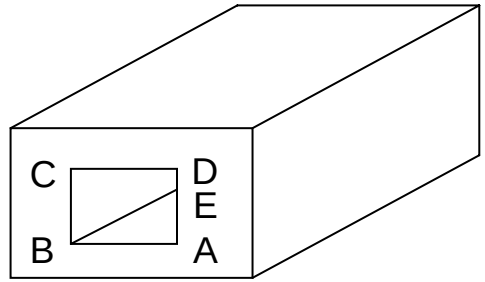
Aufgabe 3

A:

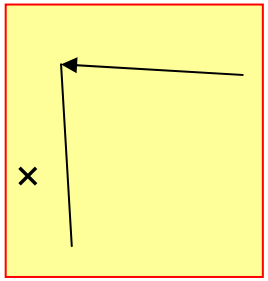


B:

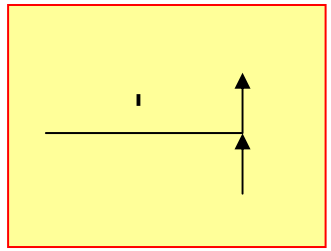




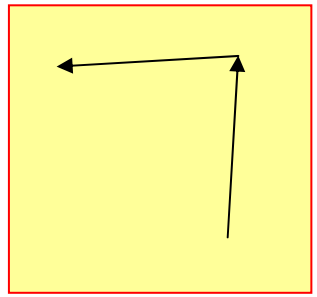
C:



E:



D:



C: keine Änderung L=(E)

E: keine Änderung L=(Ø)

Aufgabe 4