H3

a)

$$\Delta t' = \gamma\left(\Delta t - \frac{v}{c^2}\Delta z\right)$$
$$= \gamma(\alpha - \beta)\frac{\Delta z}{c}$$
$$= \gamma\,\frac{\alpha-\beta}{\alpha}\,\Delta t$$

$$z' = \gamma(z - vt)$$
$$\Delta z' = \gamma(\Delta z - v\Delta t)$$
$$= \gamma\,\Delta z\,(1 - \alpha\beta)$$

b) zeitartig ($\alpha > 1$)

$\alpha > 1,\ \beta \leq 1 \rightarrow \alpha - \beta > 0 \rightarrow \Delta t' > 0$ für $\Delta t > 0$

wähle v so, dass $1 - \alpha\beta = 0$: $v = \frac{c}{\alpha}$

c) raumartig ($\alpha < 1$)

für $\beta \geq \alpha$: $\Delta t' \leq 0$ für $\Delta t > 0$

H4

b) $\beta = \frac{v}{c} = 0.8 = \frac{4}{5}$

$$\gamma = \frac{1}{\sqrt{1-\beta^2}} = \frac{1}{\sqrt{\frac{5^2-4^2}{5^2}}} = \frac{5}{3}$$

$$\beta\gamma = \frac{4}{5}\frac{5}{3} = \frac{4}{3}$$

$$\Lambda = \begin{pmatrix} \gamma & \beta\gamma \\ \beta\gamma & \gamma \end{pmatrix} = \frac{1}{3}\begin{pmatrix} 5 & 4 \\ 4 & 5 \end{pmatrix}$$

$$c' = \frac{1}{3}\begin{pmatrix} 5 & 4 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} 5 \\ -4 \end{pmatrix} = \frac{1}{3}\begin{pmatrix} 5\cdot 5 - 4\cdot 4 \\ 4\cdot 5 - 5\cdot 4 \end{pmatrix} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$$

$$d' = \frac{1}{3}\begin{pmatrix} 5 & 4 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} 3 \\ 0 \end{pmatrix} = \frac{1}{3}\begin{pmatrix} 3\cdot 5 \\ 3\cdot 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$$

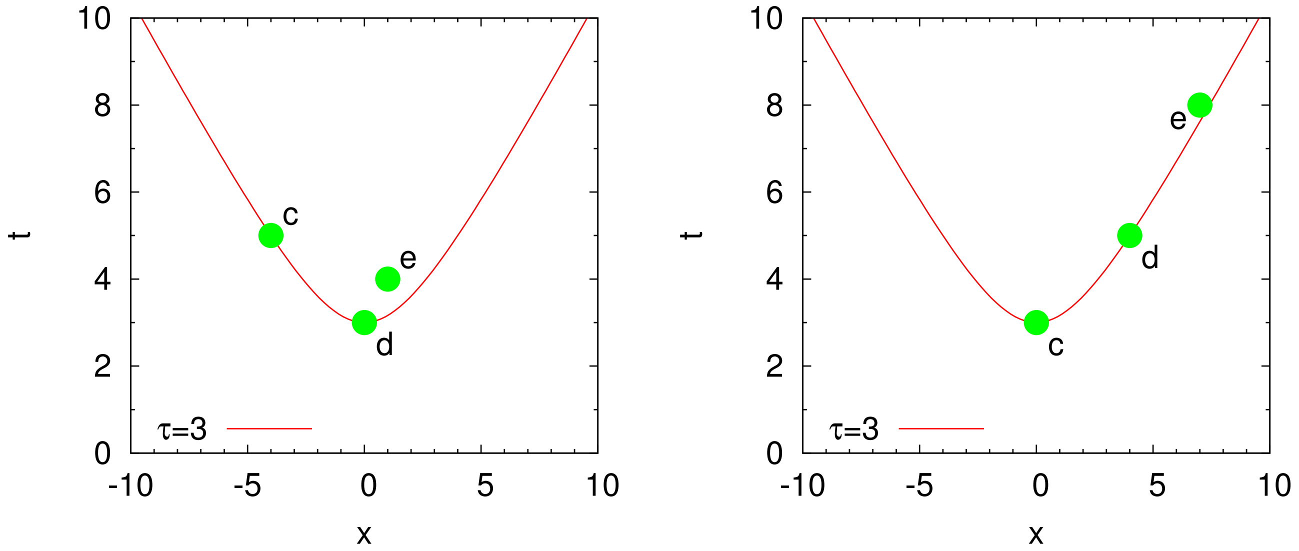
$$e' = \frac{1}{3}\begin{pmatrix} 5 & 4 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} 4 \\ 1 \end{pmatrix} = \frac{1}{3}\begin{pmatrix} 4\cdot 5 + 4 \\ 4\cdot 4 + 5 \end{pmatrix} = \begin{pmatrix} 8 \\ 7 \end{pmatrix}$$

in Σ: d vor e vor c

in Σ': c vor d vor e

a) $a_\mu b^\mu = 3\cdot 4 - 3\cdot 1 - 2\cdot 2 - 3\cdot 3$

$= -4$



t
x
τ=3
c
d
e
10
8
6
4
2
0
-10
-5
0
5
10