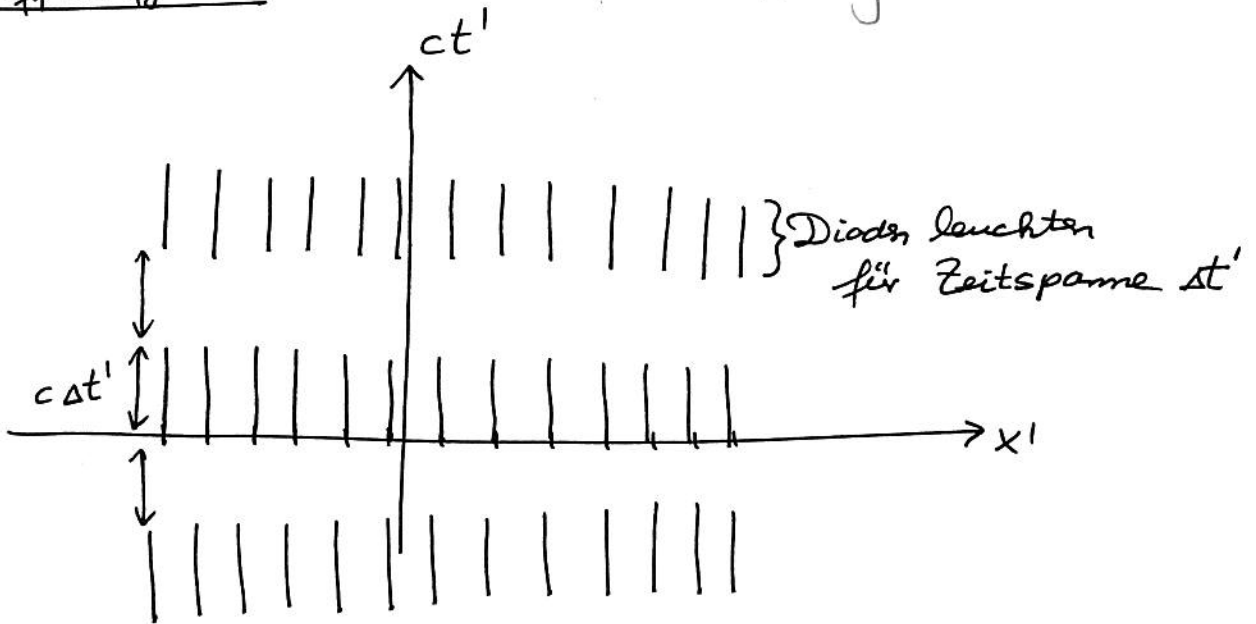
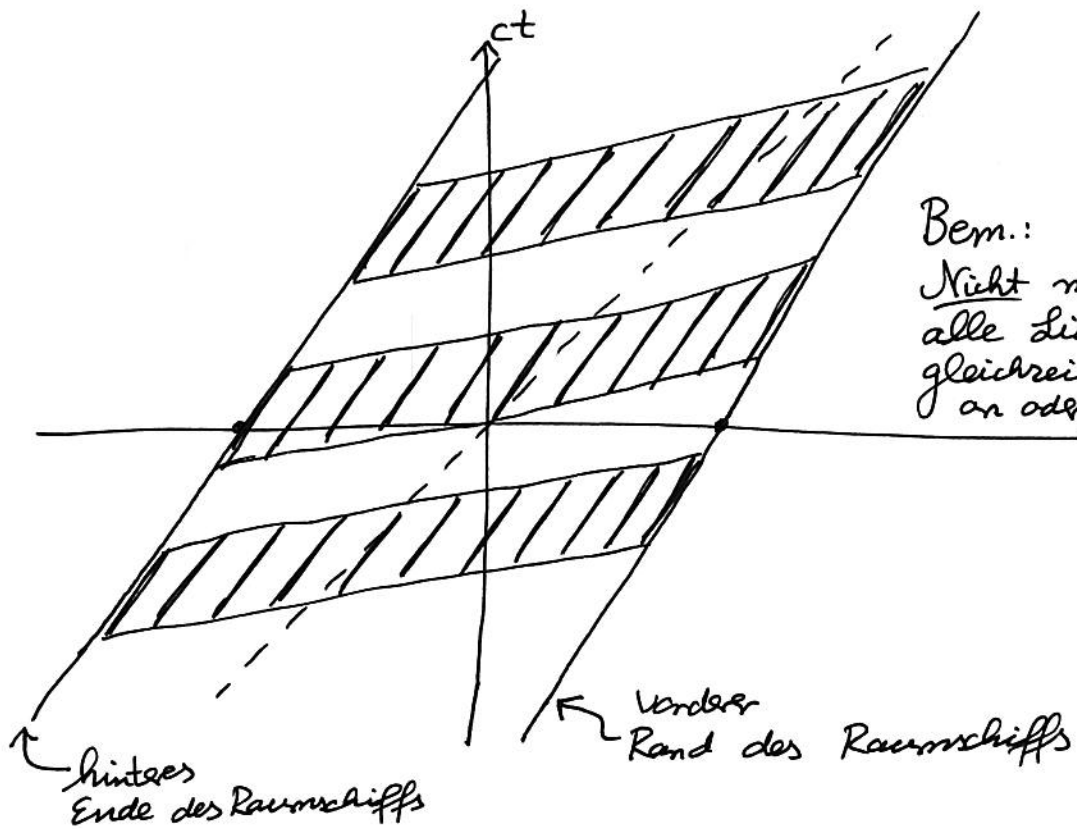


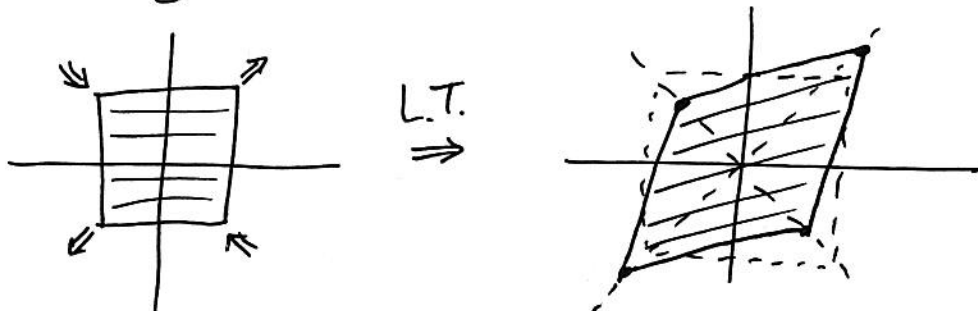
(a)



(b) L.T. $x = \frac{x' + vt'}{\sqrt{1 - \frac{v^2}{c^2}}}$, $t = \frac{t' + \frac{v}{c^2}x'}{\sqrt{1 - \frac{v^2}{c^2}}}$



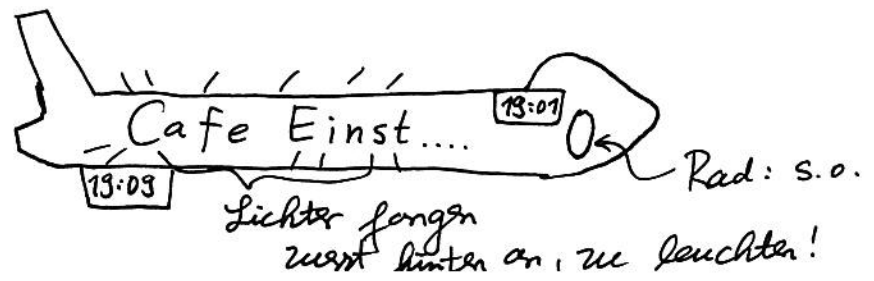
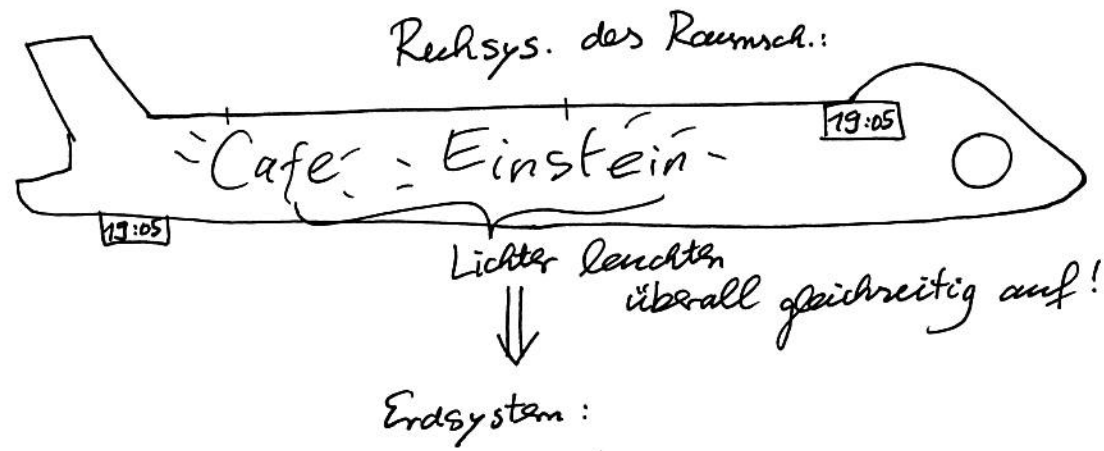
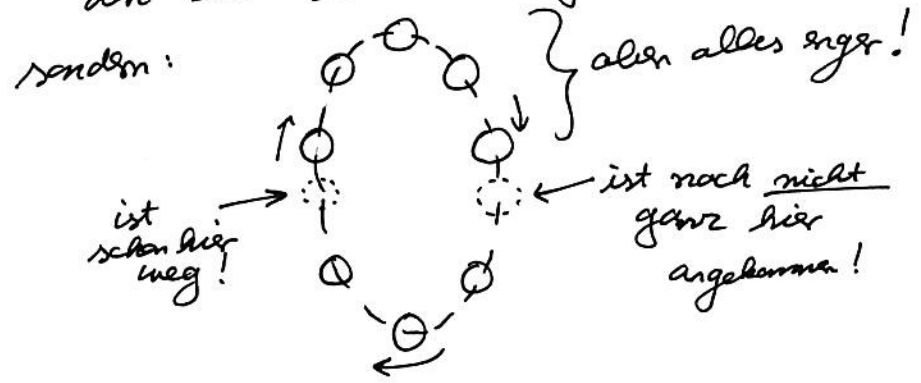
Wiederholung:



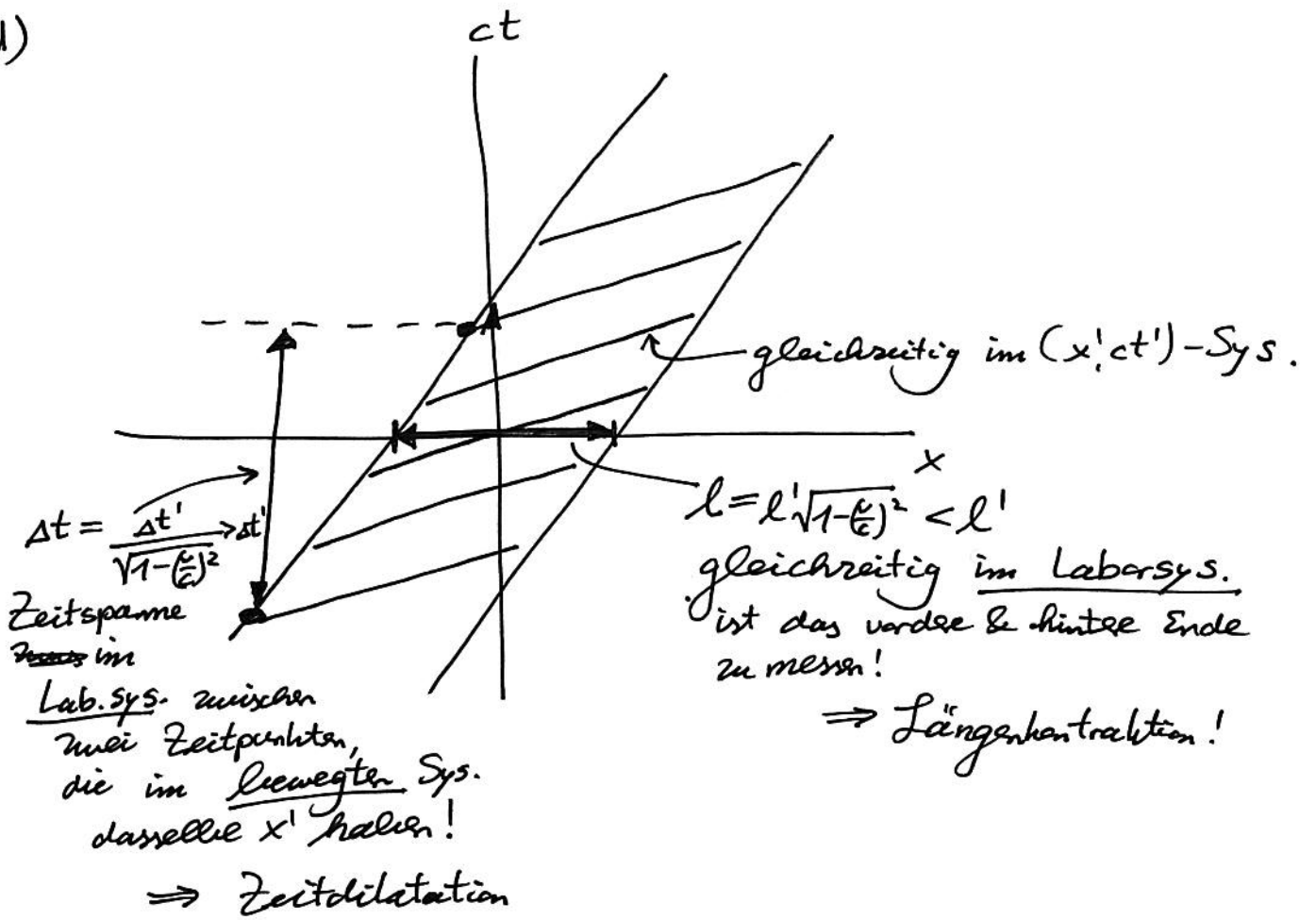
(c)

Bem. zu Effekten:

- Lorentzkontraktion $l = l' \sqrt{1 - (\frac{v}{c})^2}$
 ↑
 Erdsys.
- keine Gleichzeitigkeit:
 Lichter leuchten am hintern Rand
 zuerst auf!
- hintere Uhr muss aus demselben Grund
 schon weiter gelaufen sein! (im Vgl. zur vorderen)
- Zum Rad: hinten passiert alles früher,
 vorne alles später \Rightarrow
 im Erdsystem sind ~~nicht~~ alle
~~Bälle auf~~ die Winkel zwischen
 den Bällen nicht alle gleich!



(d)



$$Y_{\ell=1, m=0} = \sqrt{\frac{3}{4\pi}} \cos \theta$$

$$N_{\ell m} = \sqrt{\frac{2\ell+1}{4\pi} \frac{(\ell-m)!}{(\ell+m)!}} \quad 1$$

$$Y_{\ell=1, m=1} = -\sqrt{\frac{3}{8\pi}} e^{i\varphi} \sin \theta$$

$$P_{\ell=1}^{m=0}(x) = x$$

$$Y_{\ell=0, m=0} = \sqrt{\frac{1}{4\pi}}$$

$$Y_{\ell m} = N_{\ell m} e^{im\varphi} P_{\ell}^m(\cos \theta)$$

$$Y_{\ell=2, m=0} = \sqrt{\frac{5}{4\pi}} \frac{1}{2} (3 \cos^2 \theta - 1)$$

$$P_{\ell=1}^{m=1}(x) = -(1-x^2)^{1/2}$$

$$P_{\ell=2}^{m=0}(x) = \frac{1}{2} (3x^2 - 1)$$

$$Y_{\ell=2, m=1} = -\sqrt{\frac{5}{4\pi \cdot 3!}} e^{i\varphi} 3 \cos \theta \sin \theta$$

$$P_{\ell=2}^{m=1}(x) = -3x\sqrt{1-x^2}$$

⇒

$$Y_{\ell=1, m=0} \cdot Y_{\ell=1, m=1} = -\frac{3}{4\pi} \frac{1}{\sqrt{2}} e^{i\varphi} \sin \theta \cos \theta$$

$$= + \sqrt{\frac{3}{4\pi \cdot 5}} Y_{\ell=2, m=1}$$

$$[Y_{\ell=1, m=0}]^2 = \frac{3}{4\pi} \cos^2 \theta$$

$$= \frac{3}{4\pi} \left\{ \frac{2}{3} \sqrt{\frac{4\pi}{5}} \cdot Y_{\ell=2, m=0} + \frac{1}{3} \right\}$$

$$= \sqrt{\frac{1}{5\pi}} Y_{\ell=2, m=0} + \frac{1}{\sqrt{4\pi}} Y_{\ell=0, m=0} \quad \left| \quad = \frac{1}{3} \sqrt{4\pi} Y_{\ell=0, m=0} \right.$$

$\underbrace{\frac{1}{\sqrt{4\pi}} Y_{\ell=0, m=0}}_{= (Y_{\ell=0, m=0})^2}$

~~Dis~~

(b)

