

## 18. Lorentzova transformace - čas

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13:32

- Jak se transformuje čas?  $\rightarrow$  Dosadíme do  $x$  za  $\tilde{x}$

- $x = \gamma(\tilde{x} + v\tilde{t}) = \gamma(\gamma(x - vt) + v\tilde{t})$  | Vyjádříme  $\tilde{t}$

$$x = \gamma^2(x - vt) + \gamma v \tilde{t} \rightarrow \tilde{t} = \frac{x - \gamma^2(x - vt)}{\gamma v}$$

$$\tilde{t} = \frac{x - \gamma^2 x + \gamma^2 vt}{\gamma v} = \frac{x(1 - \gamma^2)}{\gamma v} + \gamma t$$

$$\tilde{t} = \gamma \left( \frac{x(1 - \gamma^2)}{\gamma^2 v} + t \right)$$

$$\gamma^2 = \frac{1}{1 - \frac{v^2}{c^2}}$$

$$\tilde{t} = \gamma \left( \frac{x}{v} \cdot \left( -\frac{v^2}{c^2} \right) + t \right)$$

$$\frac{1}{\gamma^2} = 1 - \frac{v^2}{c^2}$$

$$\underline{\underline{\tilde{t} = \gamma \left( t - \frac{x \cdot v}{c^2} \right)}}$$

$$\frac{1 - \gamma^2}{\gamma^2} = \left( 1 - \frac{v^2}{c^2} - 1 \right) = -\frac{v^2}{c^2}$$

Časoprostor / událost  $\beta = \frac{v}{c}$

$$\tilde{t} = \gamma \left( t - \frac{x \cdot v}{c^2} \right)$$

$$\tilde{x} = \gamma(x - vt)$$

$$\tilde{y} = y$$

$$\tilde{z} = z$$

$$\Lambda = \begin{pmatrix} \gamma & -\beta\gamma & 0 & 0 \\ -\beta\gamma & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad \text{Lorentzova matice}$$