

$$\begin{cases} ct' = \gamma ct - \gamma \beta x \\ x' = -\gamma \beta ct + \gamma x \end{cases} \quad \begin{pmatrix} ct' \\ x' \end{pmatrix} = \begin{pmatrix} \gamma & -\gamma \beta \\ -\gamma \beta & \gamma \end{pmatrix} \begin{pmatrix} ct \\ x \end{pmatrix}$$

$$\text{これを } \begin{pmatrix} ct \\ x \end{pmatrix} \text{ について解く.} \quad \begin{pmatrix} ct \\ x \end{pmatrix} = \frac{1}{\gamma^2 - \gamma^2 \beta^2} \begin{pmatrix} \gamma & \gamma \beta \\ \gamma \beta & \gamma \end{pmatrix}$$

$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \quad A^{-1} = \frac{1}{ad-bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

さて、 K' から K を見る

K は K' の静止系 $x' = 0$ の方向に運動

$$\beta \rightarrow -\beta$$

$$\begin{pmatrix} ct \\ x \end{pmatrix} = \begin{pmatrix} \gamma & \gamma \beta \\ \gamma \beta & \gamma \end{pmatrix} \begin{pmatrix} ct' \\ x' \end{pmatrix}$$

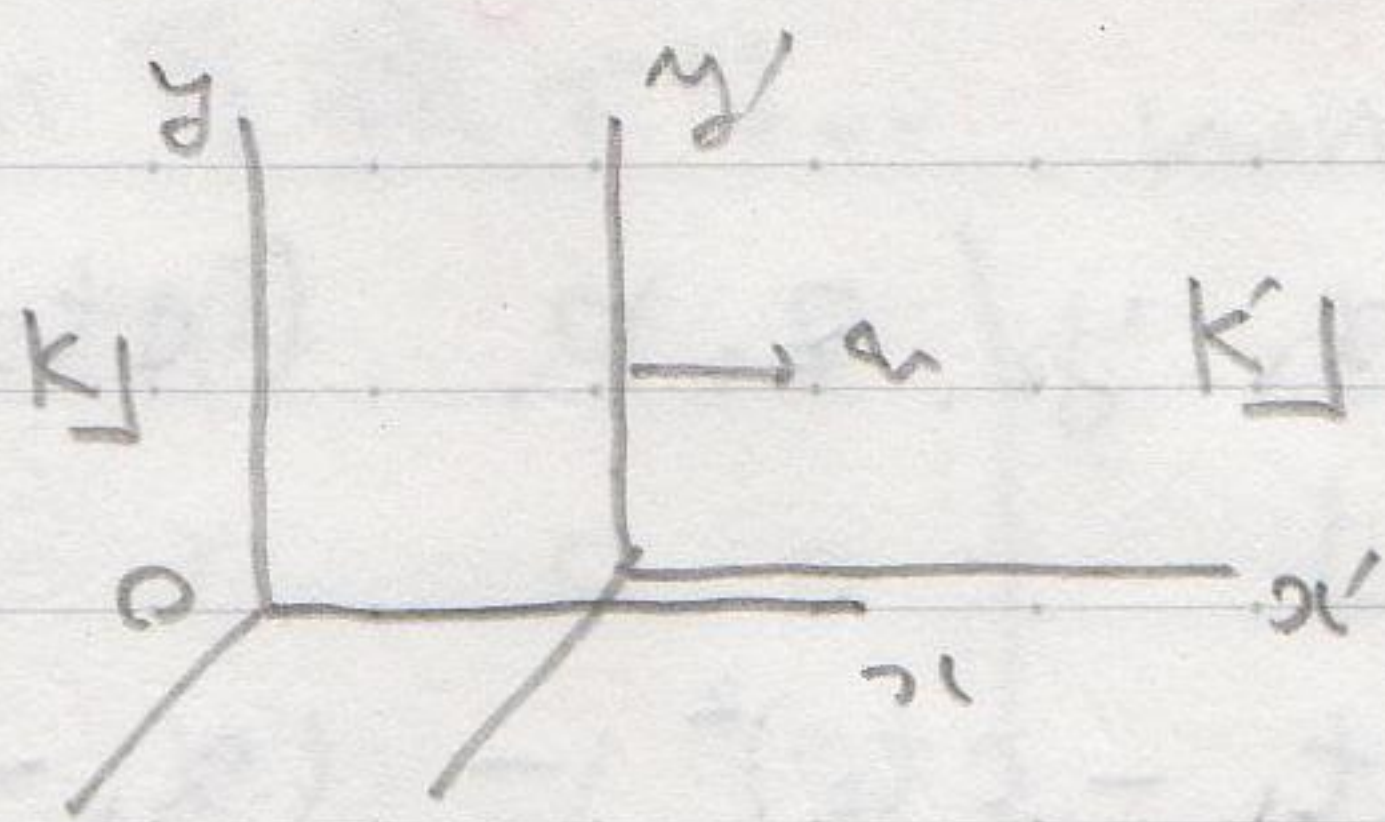
$$\gamma^2 - \gamma^2 \beta^2 = 1 \quad \gamma = \pm \frac{1}{\sqrt{1-\beta^2}}$$

$|v| \ll c$ Galilei 変換に一致

$$\gamma = \pm \left(1 - \frac{1}{2} \beta^2 + \dots \right)$$

$$\beta \rightarrow 0 \quad \gamma \rightarrow 1 \quad \left. \begin{array}{l} ct' = ct \\ x' = -vt' \end{array} \right\} \quad \gamma \equiv \frac{1}{\sqrt{1-\beta^2}}$$

Lorentz transf.



$$\begin{pmatrix} ct' \\ x' \\ y' \\ z' \end{pmatrix} = \begin{pmatrix} \gamma \beta & -\gamma \beta & 0 & 0 \\ -\gamma \beta & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\beta \equiv \frac{v}{c}$$

$$\gamma \equiv \frac{1}{\sqrt{1-\beta^2}}$$

$$= \frac{1}{\sqrt{1-(v/c)^2}}$$