Física IV

8 dezembro

Relatividade restrita

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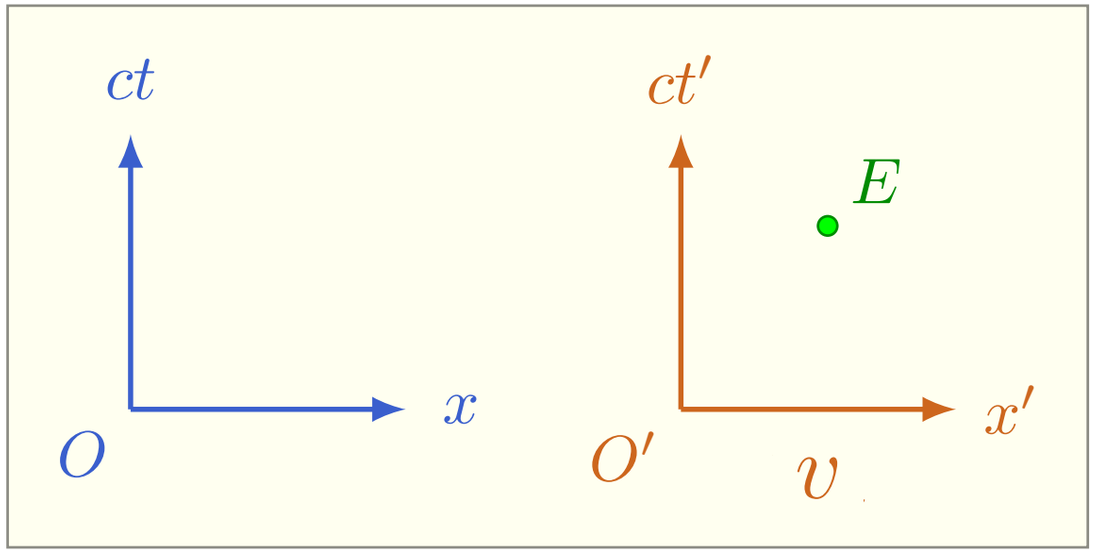
Transformação de Lorentz

$$\begin{bmatrix} ct' \\ x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \end{bmatrix}$$



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

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

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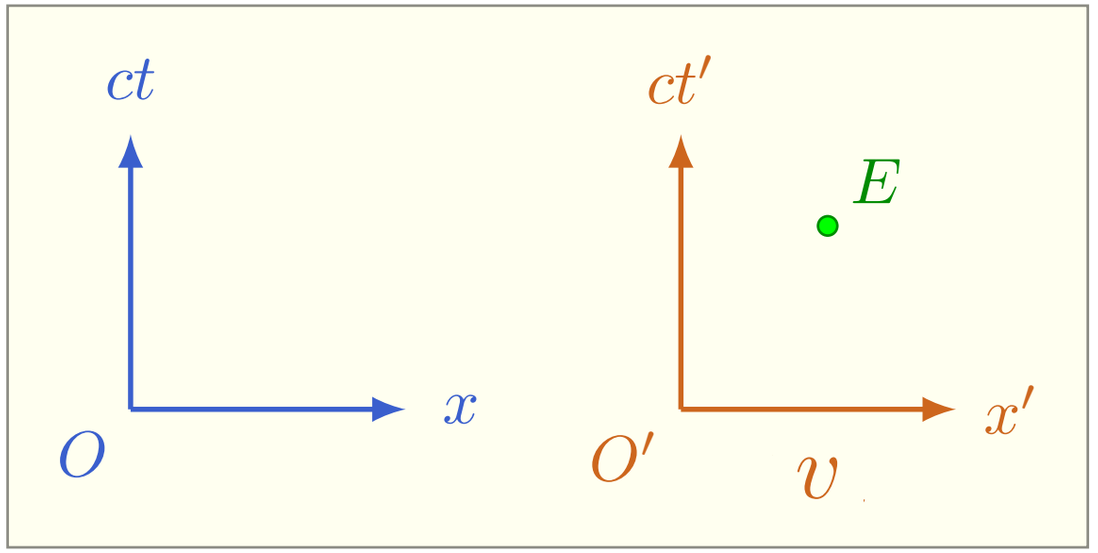

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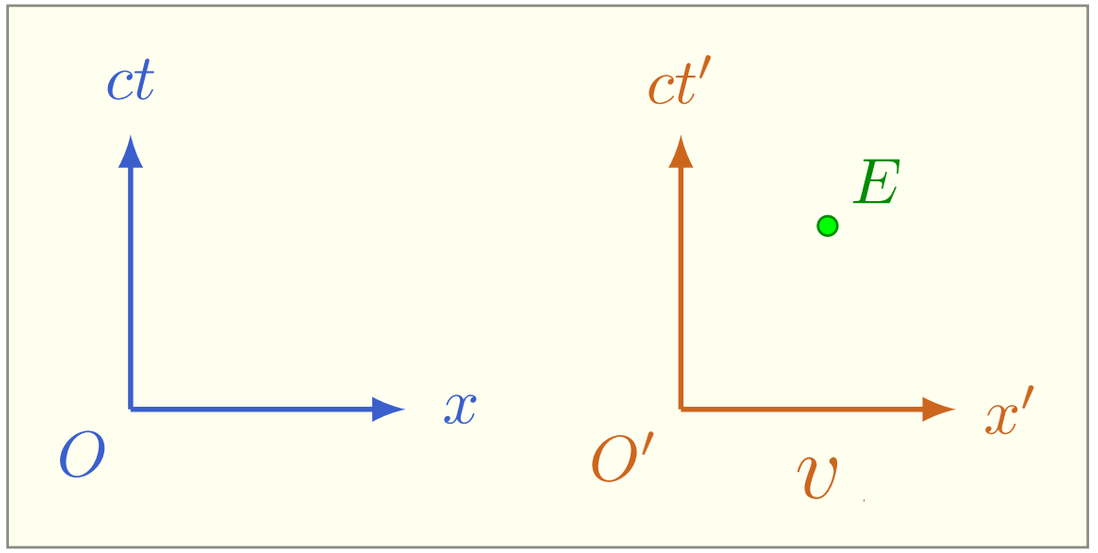

$$\tanh(a) \equiv \beta$$

$$\cosh(a) = \frac{1}{\sqrt{1 - \tanh^2(a)}}$$

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

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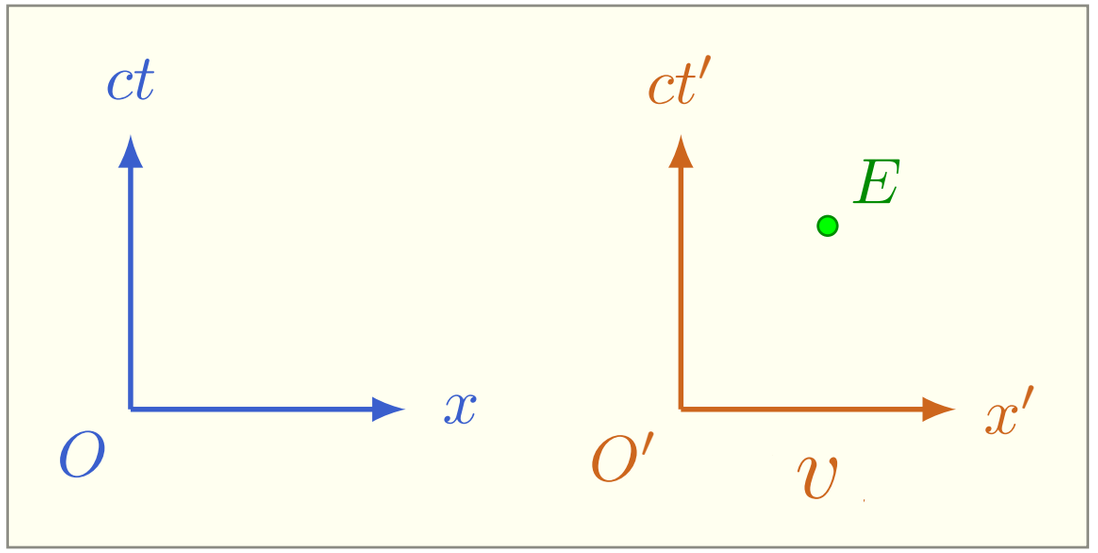

$$\tanh(a) \equiv \beta$$

$$\cosh(a) = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} = \gamma$$

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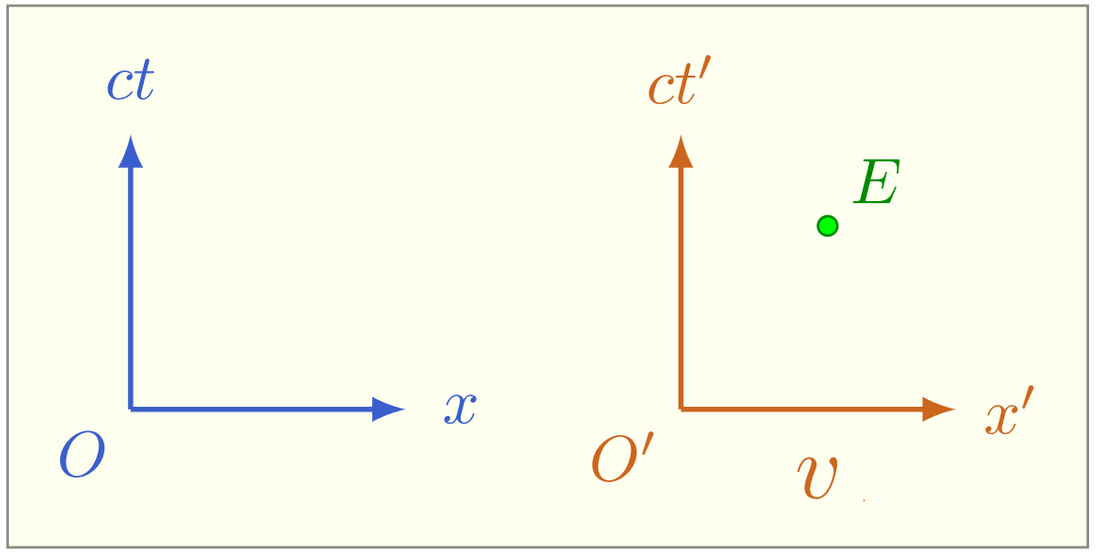

$$\tanh(a) \equiv \beta$$

$$\cosh(a) = \gamma \qquad \sinh(a) = \beta\gamma$$

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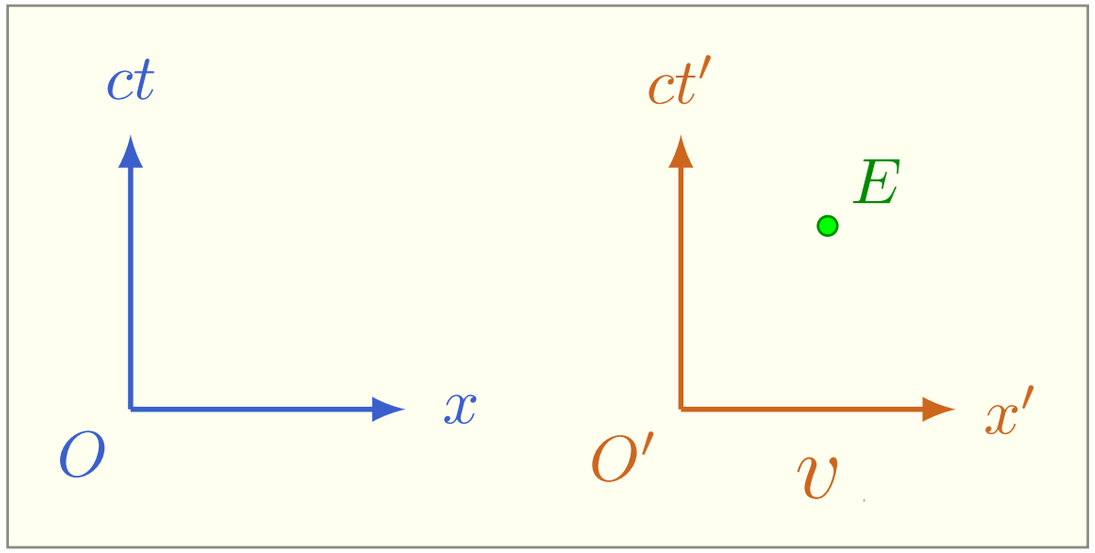

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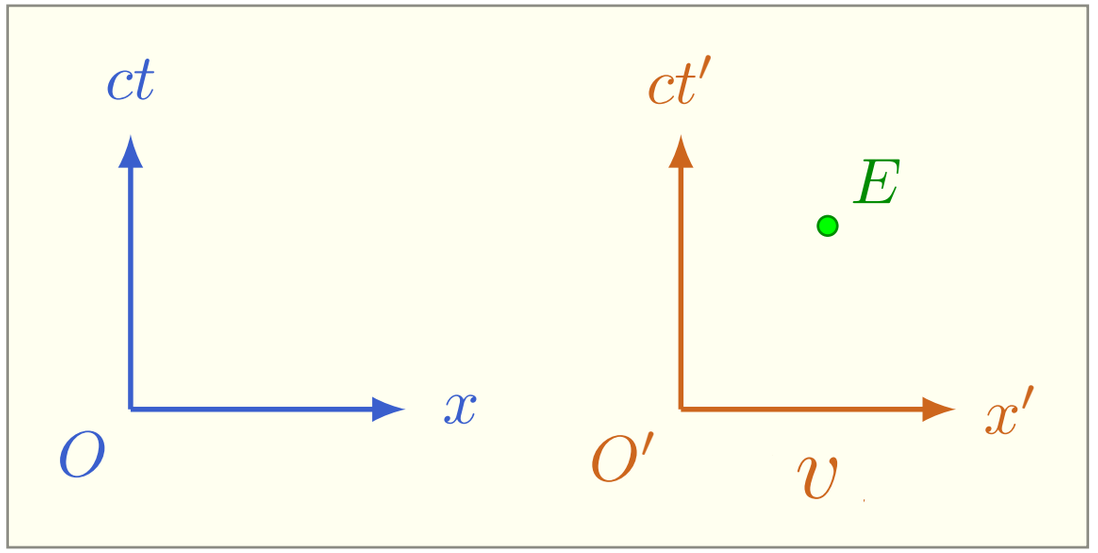

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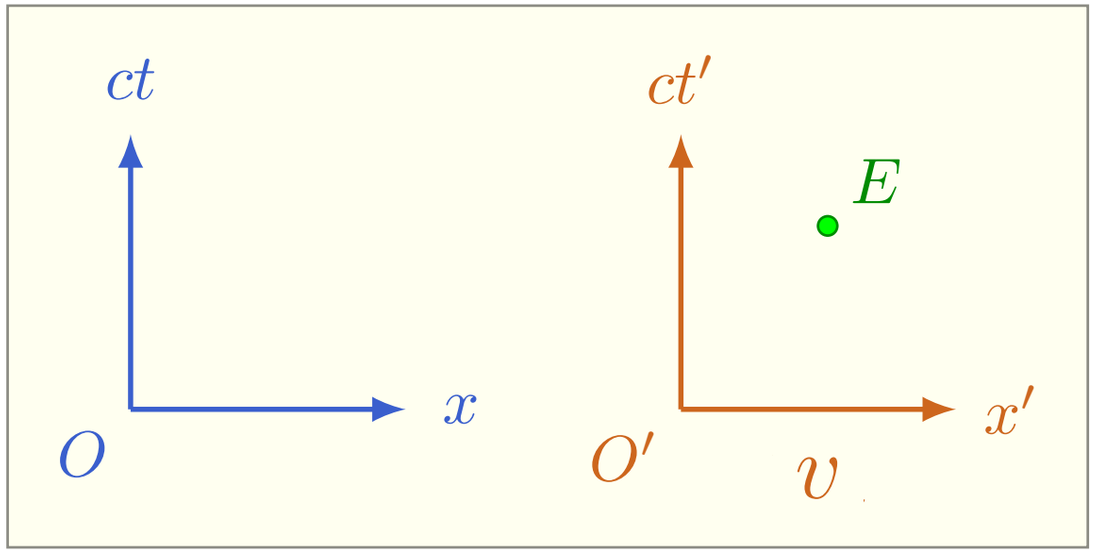

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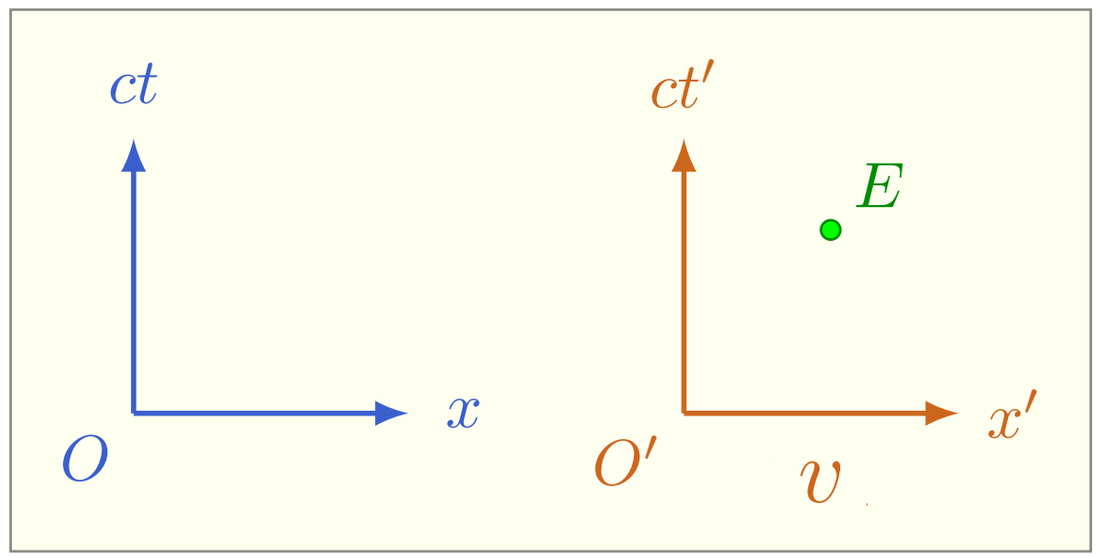

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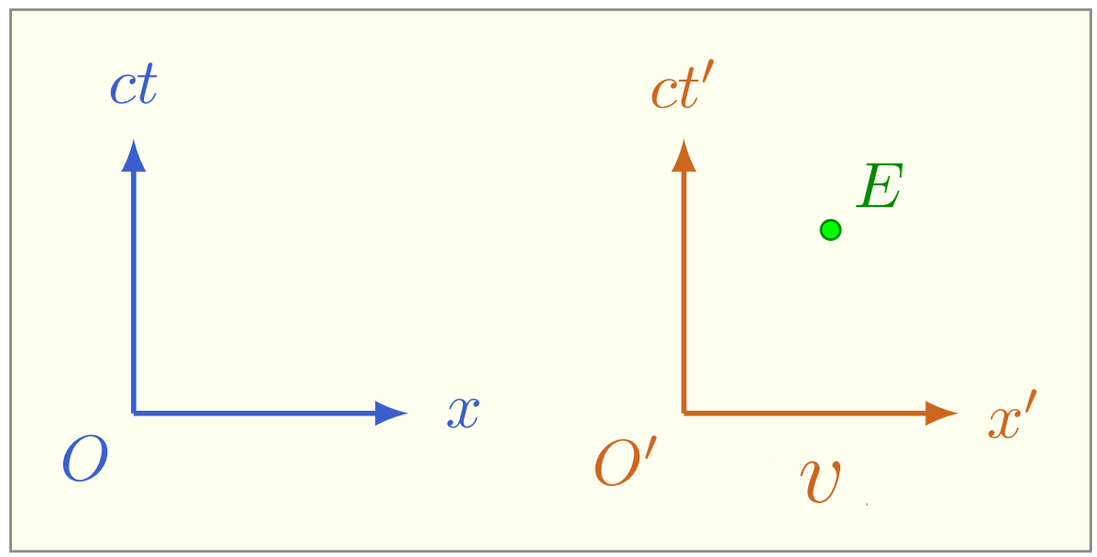

$$\det \begin{bmatrix} \cosh(a) & -\sinh(a) \\ -\sinh(a) & \cosh(a) \end{bmatrix} = 1$$

Transformação de Lorentz

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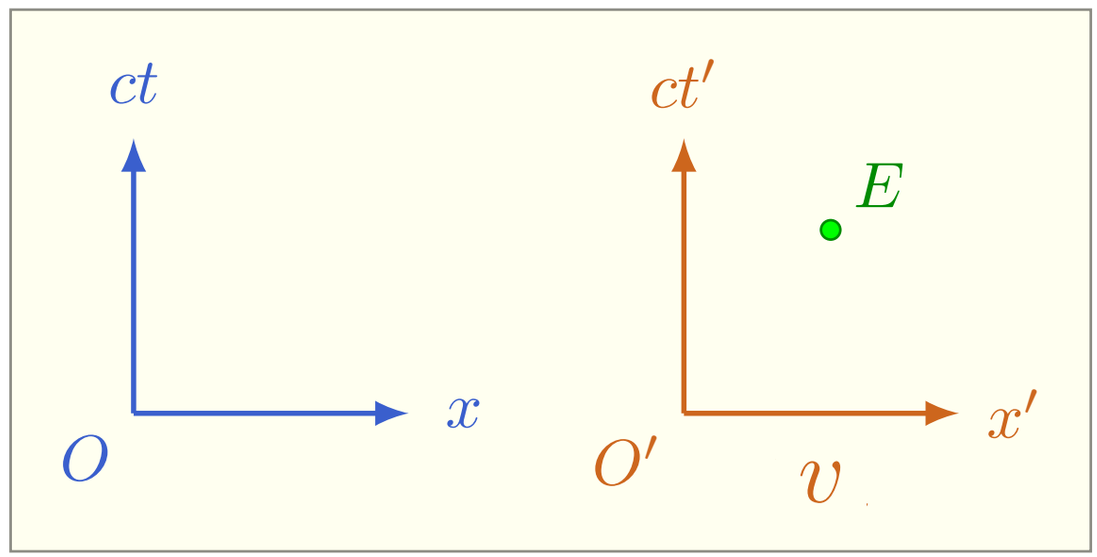

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Transformação de Lorentz

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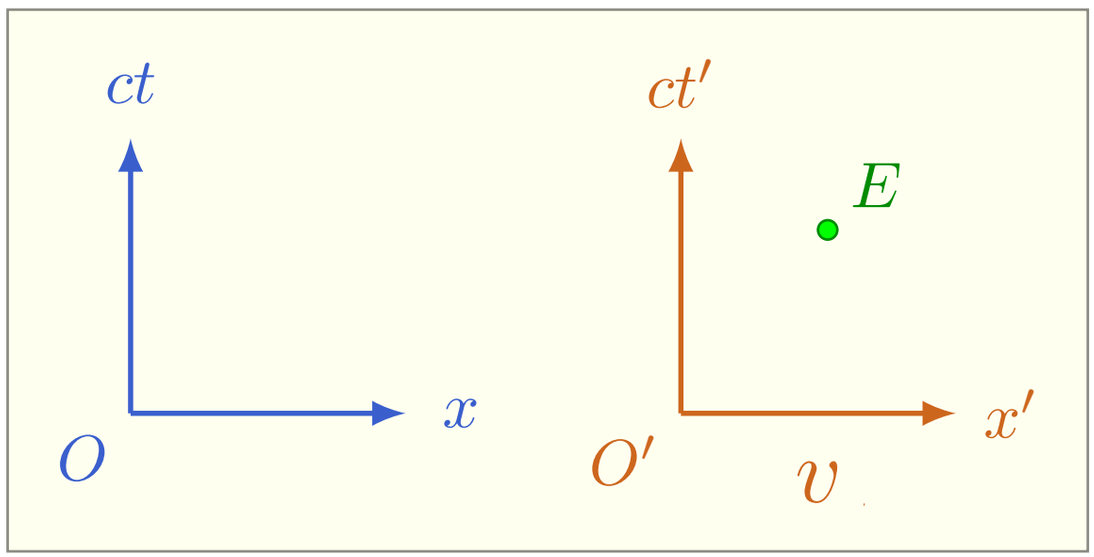
$$\Rightarrow \begin{bmatrix} ct \\ x \end{bmatrix} = \begin{bmatrix} \cosh(a) & \sinh(a) \\ \sinh(a) & \cosh(a) \end{bmatrix} \begin{bmatrix} ct' \\ x' \end{bmatrix}$$

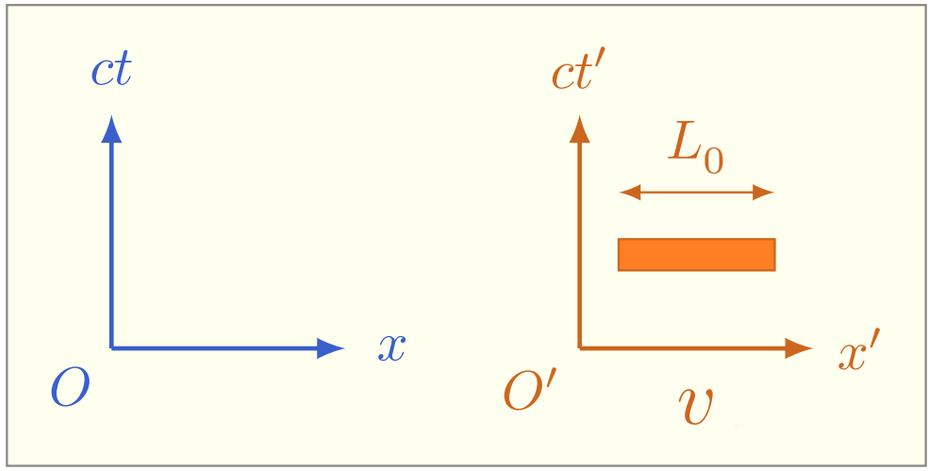


$$\begin{bmatrix} ct' \\ x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \end{bmatrix}$$

Pratique o que aprendeu

$$\begin{bmatrix} c\Delta t' \\ L_0 \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} 0 \\ L \end{bmatrix}$$

$$L = \frac{L_0}{\gamma} < L_0$$



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

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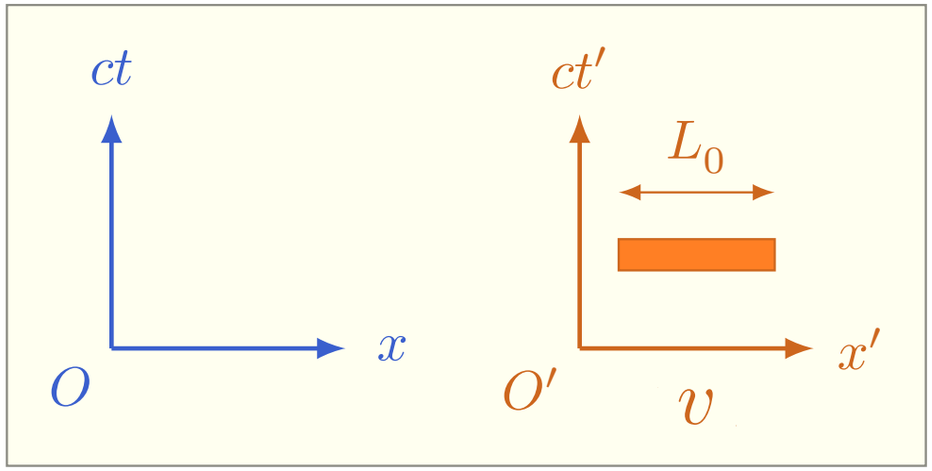


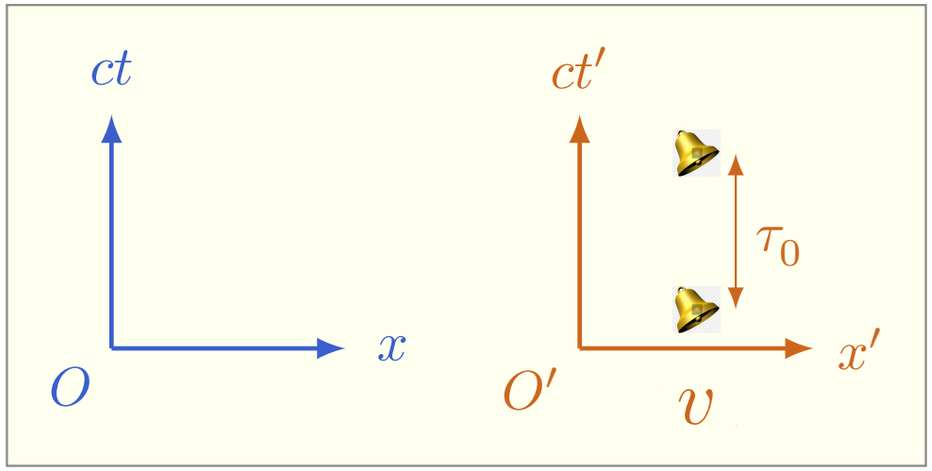
$$L = \frac{L_0}{\gamma} < L_0$$

Contração espacial

$$\begin{bmatrix} ct' \\ x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \end{bmatrix}$$

Pratique o que aprendeu

$\tau = ?$



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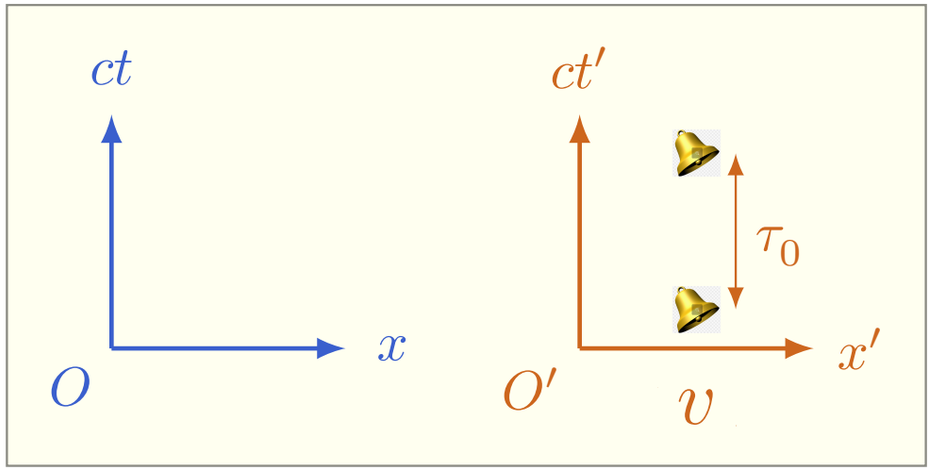
$$\begin{bmatrix} ct' \\ x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \end{bmatrix}$$

Pratique o que aprendeu

Eventos

$x'_i = x_0 \qquad t'_i = 0$

$x'_f = x_0 \qquad t'_f = \tau_0$



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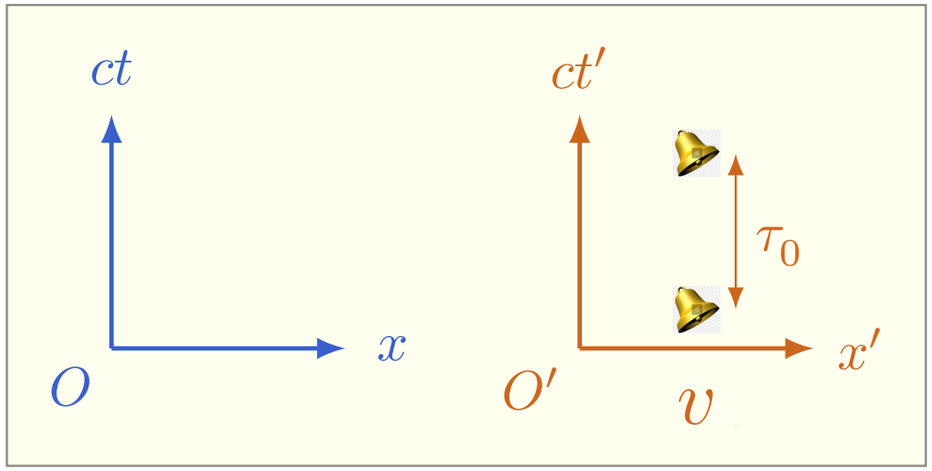

$x_i = ? \qquad t_i = ?$

$x_f = ? \qquad t_f = ?$

$$\begin{bmatrix} c\Delta t' \\ \Delta x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} c\Delta t \\ \Delta x \end{bmatrix}$$

$$\begin{bmatrix} c\tau_0 \\ 0 \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} c\tau \\ \Delta x \end{bmatrix}$$

$$\begin{bmatrix} ct' \\ x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \end{bmatrix}$$

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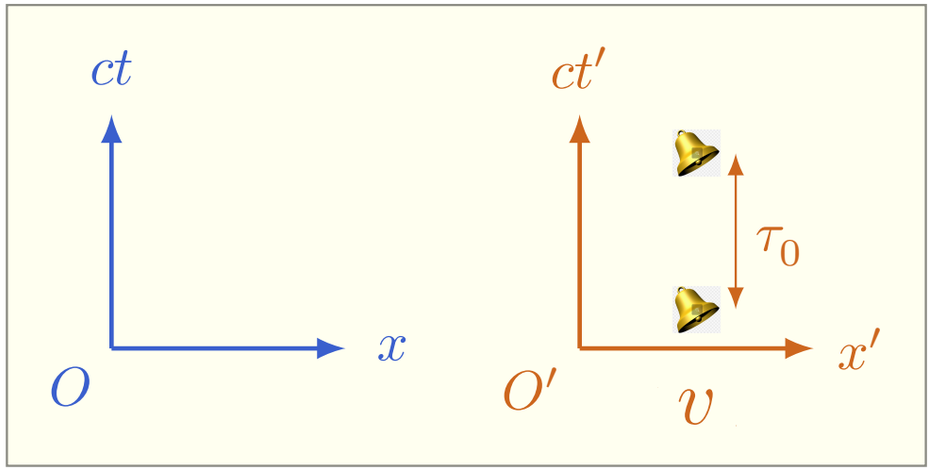

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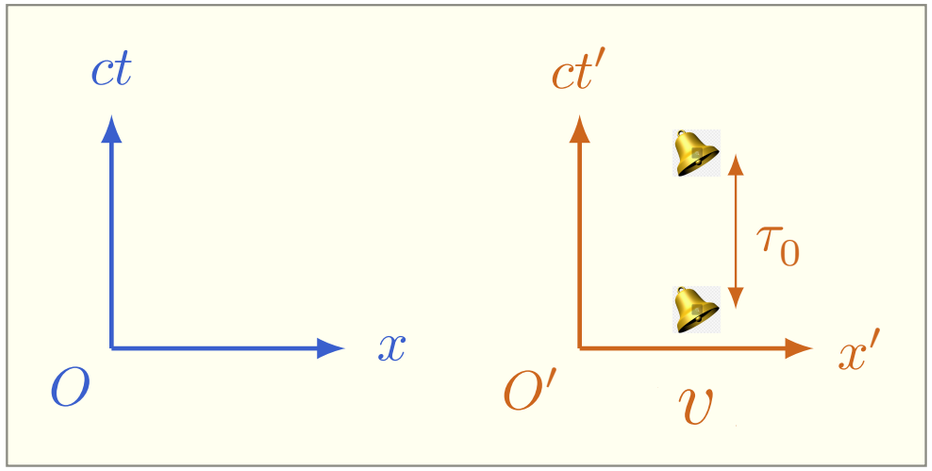

$$\begin{bmatrix} c\tau \\ \Delta x \end{bmatrix} = \gamma \begin{bmatrix} 1 & \beta \\ \beta & 1 \end{bmatrix} \begin{bmatrix} c\tau_0 \\ 0 \end{bmatrix}$$

$$\Rightarrow c\tau = \gamma c\tau_0$$

$$\begin{bmatrix} ct' \\ x' \end{bmatrix} = \gamma \begin{bmatrix} 1 & -\beta \\ -\beta & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \end{bmatrix}$$

Pratique o que aprendeu

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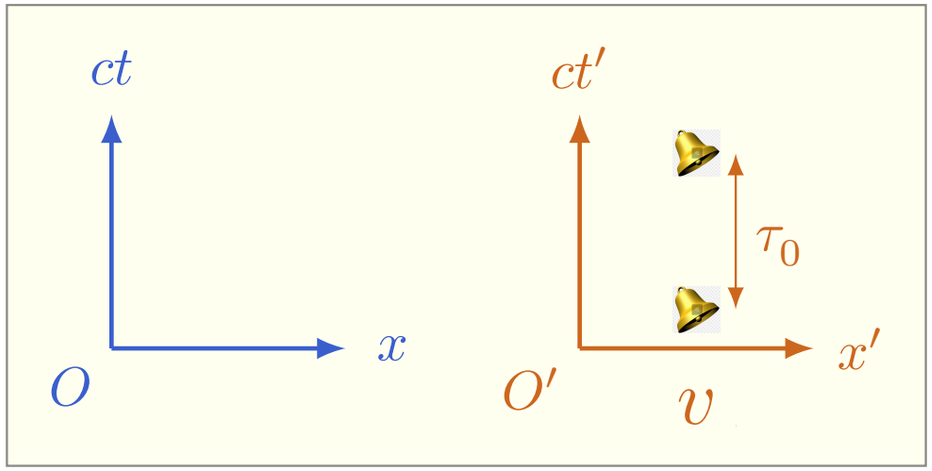

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$$\tau = \gamma\tau_0$$

Dilatação temporal

Trabalhos criativos

- Grupo 1: Holografia
- Grupo 3: Dispersão no índice de refração
- Grupo 4: Ótica da visão
- Grupo 8: Polimerização via absorção de dois fótons
- Grupo 15: Espectro de ionização de gases e sólidos (texto)
- Grupo 15: Espectro de ionização de gases e sólidos (vídeo)
- Grupo 16: Retificador de onda completo
- Grupo 18: Fibras óticas