

Speed of light:

$$c^2 = dx^2/dt^2 \quad v^2 = dx^2/dt^2 \quad dx^2 = d\vec{x}^2 + c^2 \cdot dt^2$$

$$d\vec{x}^2 = dx_1^2 + dx_2^2 + dx_3^2$$

$$v^2 = \frac{d\vec{x}^2}{dt^2} + c^2$$

$$(c^2 - v^2) = - \frac{d\vec{x}^2}{dt^2} \quad c^2 \gg v^2 \quad \text{i} \quad c^2 = (d\vec{x}^2 + c^2 \cdot dt^2)/d\tau^2$$

$$1 = \frac{d\vec{x}^2}{c^2 d\tau^2} + \frac{dt^2}{d\tau^2} \quad 1 - \frac{dt^2}{d\tau^2} = \frac{d\vec{x}^2}{c^2 d\tau^2} \quad c^2 = \frac{d\vec{x}^2}{(1 - \frac{dt^2}{d\tau^2}) d\tau^2}$$

$$c^2 = \frac{d\vec{x}^2}{d\tau^2 - dt^2} \quad v^2 = \frac{d\vec{x}^2}{dt^2} + \frac{d\vec{x}^2}{d\tau^2 - dt^2}$$

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