Speed of light:

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

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

$dt^2=\frac{dx^2-d\vec{x}^2}{c^2}$ $dt^2= d\tau^2-\frac{d\vec{x}^2}{c^2}$

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

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

$c^2 \gg v^2$

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

$c^2=\frac{d\vec{x}^2}{(d\tau^2-dt^2)}$ to reach finally: $v^2=\frac{d\vec{x}^2}{dt^2}+\frac{d\vec{x}^2}{(d\tau^2-dt^2)}$