Velocity is a defined quantity:

$$\mathbf{u} = \frac{\Delta \mathbf{r}}{\Delta t} = \langle \frac{\Delta x}{\Delta t}, \frac{\Delta y}{\Delta t}, \frac{\Delta z}{\Delta t} \rangle$$

In another inertial frame, seen to be moving to the right, parallel to x, observers see:

$$\mathbf{u}' = \frac{\Delta \mathbf{r}'}{\Delta t'} = \langle \frac{\Delta x'}{\Delta t'}, \frac{\Delta y'}{\Delta t'}, \frac{\Delta z'}{\Delta t'} \rangle$$

Is velocity a 4-vector?

A. Yes

B. No

Which of the following equations is the correct way to write out the Lorentz scalar product?

A. $a \cdot b = -a^0 b^0 + a^1 b^1 + a^2 b^2 + a^3 b^3$

B. $a \cdot b = a_0 b^0 + a_1 b^1 + a_2 b^2 + a_3 b^3$

C. $a \cdot b = a_\nu b^\nu$

D. None of these

E. All three are correct

Imagine this quantity:

$$u^{\mu} \equiv \begin{pmatrix} c \\ \frac{\Delta x}{\Delta t} \\ \frac{\Delta y}{\Delta t} \\ \frac{\Delta z}{\Delta t} \end{pmatrix}$$

Is this quantity a 4-vector?

A. Yes, and I can say why.
B. No, and I can say why.
C. None of the above.

Imagine this quantity:

$$\eta^{\mu} \equiv \frac{1}{\Delta\tau}\begin{pmatrix} ct \\ \Delta x \\ \Delta y \\ \Delta z \end{pmatrix}$$

Is this quantity a 4-vector?

A. Yes, and I can say why.

B. No, and I can say why.

C. None of the above.

In my frame (S) I measure two events which occur at the same place, but different times t_1 and t_2 (they are NOT simultaneous)

Might you (in frame S') measure those SAME two events to occur simultaneously in your frame?

A. Possibly, if he's in the right frame!
B. Not a chance
C. Definitely need more info!
D. ???

Two events have a timelike separation. In a "1+1"-dimensional spacetime (Minkowski) diagram (x horizontal, ct vertical), the magnitude of the slope of a line connecting the two events is

A. Greater than 1
B. Equal to 1
C. Less than 1

Consider the world line of an object drawn on a Minkowski (space-time) diagram. At any point in that space, the slope of that line is:

A. larger than 1
B. less than 1
C. able to take on any value

Points that lie outside the light cone for a given event are:

A. accessible no matter where they are
B. accessible for given world lines (trajectories)
C. always inaccessible

The space time interval is defined by:

$$I \equiv x^2 + c^2 t^2$$

Events with common space time intervals lie on a hyperbole of constant I.

True or False: A Lorentz boost can allow you to shift between different hyperboles.

A. True
B. False

Consider the product of the speed of light and the proper time: $c\,d\tau$.

Is this quantity invariant?

A. Yes
B. No
C. I don't know how to tell

Is this "4-velocity" a contravariant 4-vector?

$$\eta^{\mu} \equiv \frac{dx^{\mu}}{d\tau}$$

A. Yes

B. No

C. I don't know how to tell

What is $\dfrac{dt}{d\tau}$?

A. γ
B. $1/\gamma$
C. γ^2
D. $1/\gamma^2$
E. Something else

With $\eta^0 = c\gamma$ and $\vec{\eta} = \gamma\vec{u}$, what is the square of η?

$$\eta^2 \equiv \eta \cdot \eta = \eta_\mu \eta^\mu$$

A. c^2

B. u^2

C. -c^2

D. -u^2

E. Something else

The momentum vector $\vec{p}$ is given by,

$$\vec{p} = \frac{m\vec{u}}{\sqrt{1 - u^2/c^2}}$$

What is $|\vec{p}|$ as u approaches zero?

A. zero

B. $m\,u$

C. $m\,c$

D. Something else