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 I'm in the right frame!
B. Not a chance
C. Definitely need more info!
D. ???