TRUE or FALSE: For any trajectory in a "1+1"-dimensional Minkowski diagram, the slope can be **no greater** than 1.

A. True

B. False

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

Are energy and rest mass Lorentz invariants?

A. Both energy and mass are invariants
B. Only energy is an invariant
C. Only rest mass is an invariant
D. Neither energy or mass are invariants

$$E - E_{rest} = (\gamma - 1)mc^2$$

What happens to the difference in the total and rest energies when the particle speed (u) is much smaller than c?

A. It goes to zero
B. It goes to $m\,c^2$
C. It goes to $1/2\,m\,u^2$
D. It depends

What's $p_\mu p^\mu$?

A. γmc^2
B. $-\gamma mc^2$
C. mc^2
D. $-mc^2$
E. Something else

E_{tot} is conserved but not invariant. What does that mean?

A. It's the same at any time in every reference frame.
B. It's the same at a given time in every reference frame.
C. It's the same at any time in a given reference frame.
D. Something else

m is invariant but not conserved. What does that mean?

A. It's the same at any time in every reference frame.
B. It's the same at a given time in every reference frame.
C. It's the same at any time in a given reference frame.
D. Something else

Charge is invariant and conserved. What does that mean?

A. It's the same at any time in every reference frame.
B. It's the same at a given time in every reference frame.
C. It's the same at any time in a given reference frame.
D. Something else

Do you see a problem do you see with $\mathbf{F} = \dfrac{d\mathbf{p}}{dt}$ with regard to relativity? We still define $\mathbf{p} \equiv \gamma m \mathbf{v}$.

A. There's no problem at all
B. Yup there's a problem, and I know what it is.
C. There's probably a problem, but I don't know what it is.