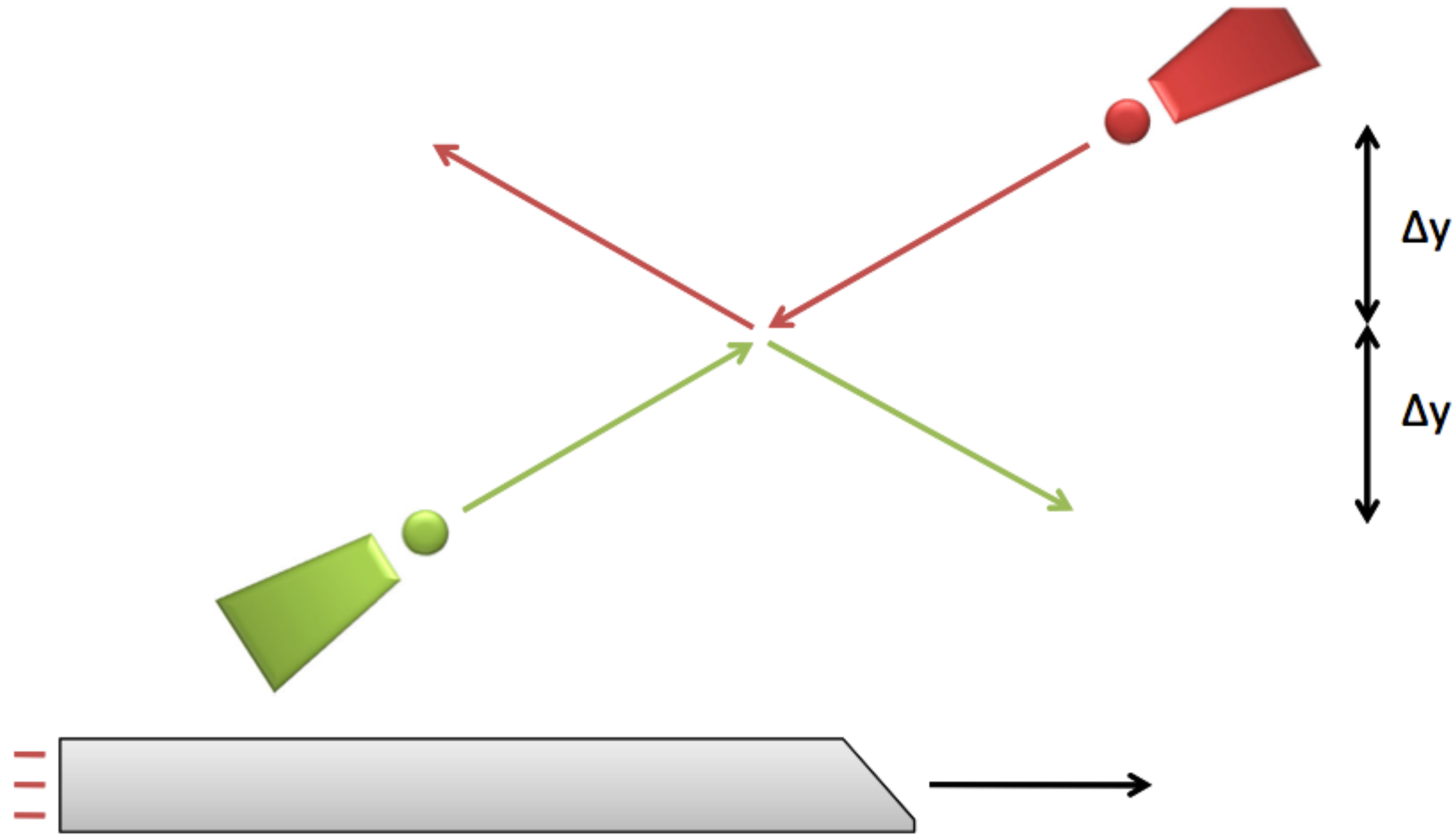
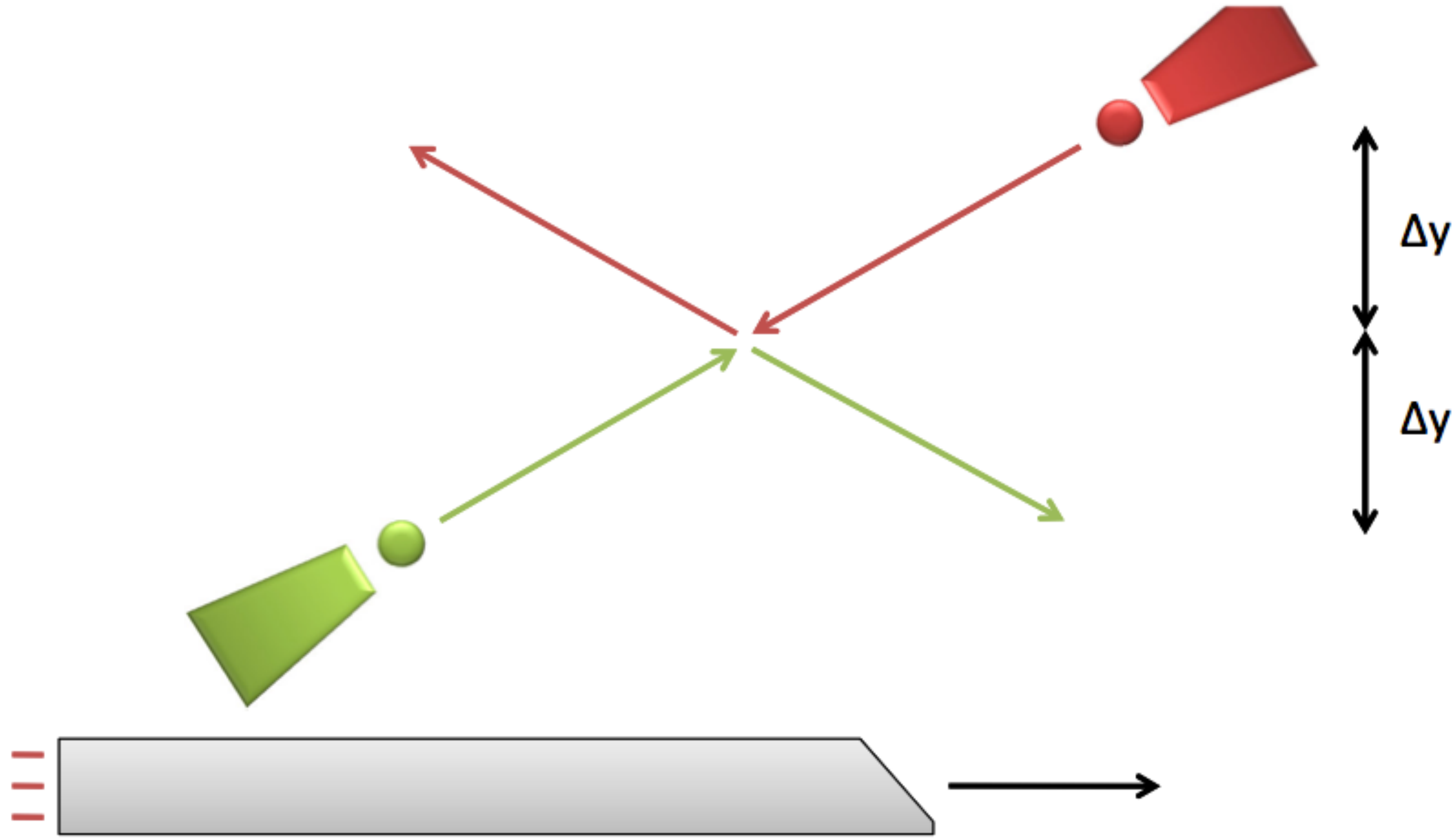
Clec12



Two cannons fire simultaneously (in the frame of the picture), and the cannonballs collide and bounce off elastically in a symmetrical collision. In the frame of the train:

A) The green cannon fires first
B) The red cannon fires first
C) Both cannonballs fire at the same time
D) The answer depends on where on the train the observer is located

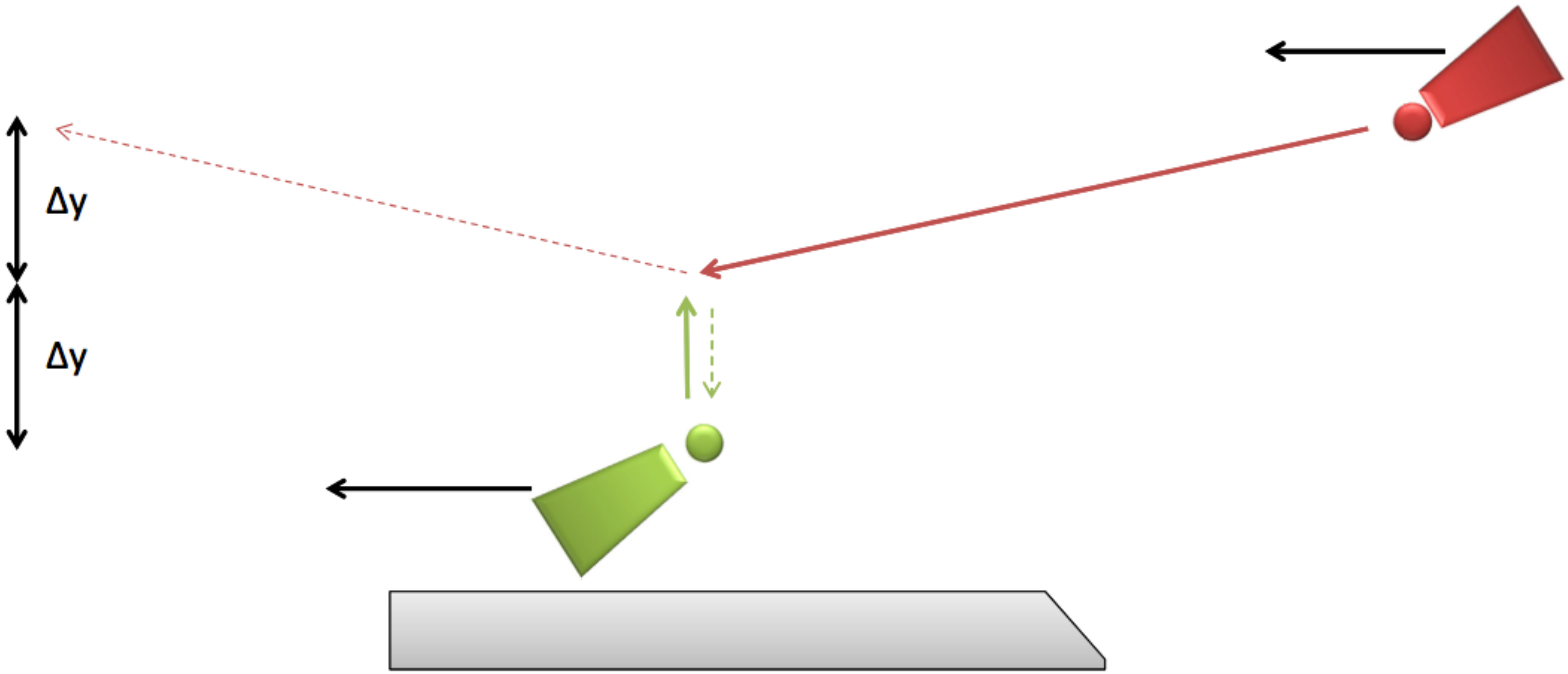
Extra: draw the trajectory of the two balls in the frame of the train if the train has the same horizontal velocity as the green ball.



Two cannons fire simultaneously (in the frame of the picture), and the cannonballs collide and bounce off elastically in a symmetrical collision. In the frame of the train:

B) The red cannon fires first

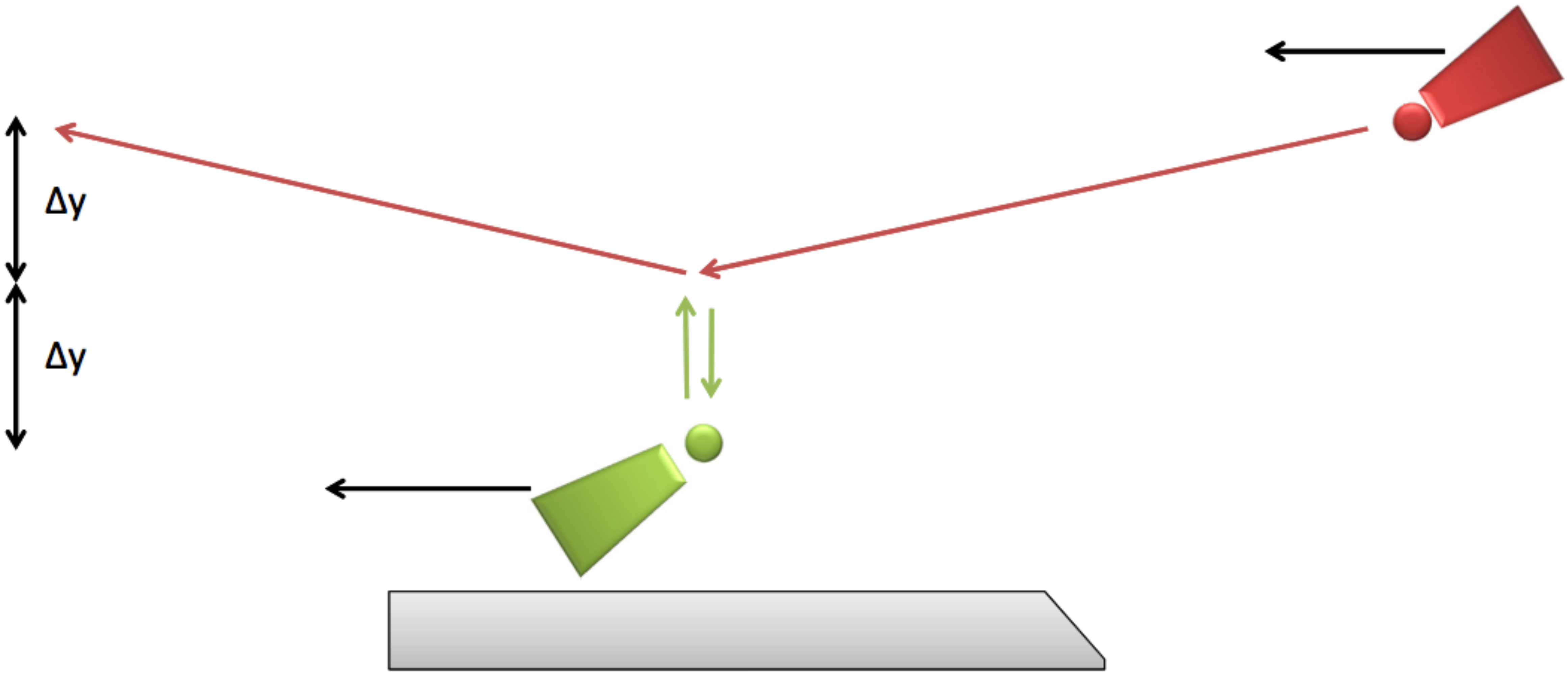
We saw last time that the clocks toward the front of the train will be observed to read an earlier time. So when the cannons fire, the clock near the red cannon will be observed to have an earlier time than the clock near the green cannon. This means that in the frame of the train, the red cannon is observed to fire first.



In the new frame, we can say that magnitude of M Δy/Δt between firing and collision:

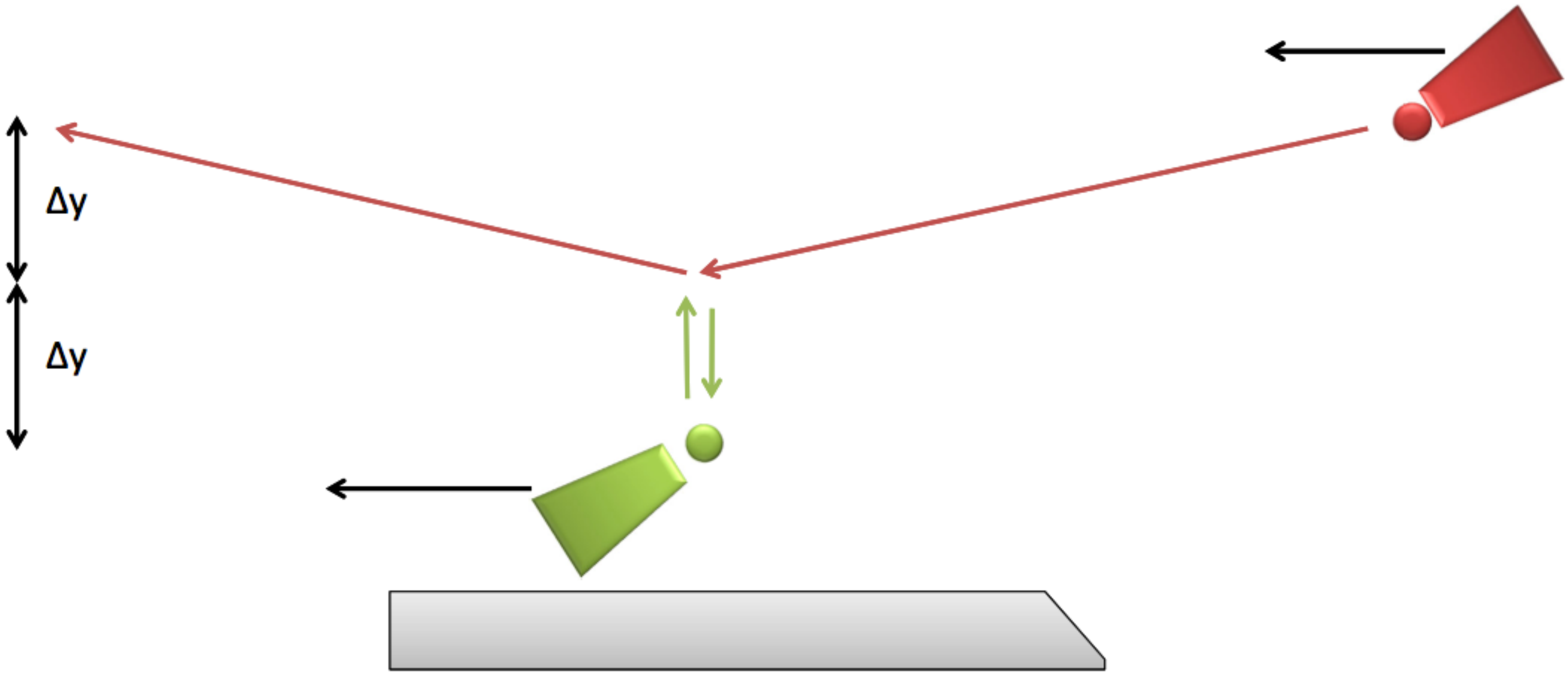
A) Is greater for the red ball
B) Is greater for the green ball
C) Is the same for both balls

Extra: Based on your answer, is y-momentum conserved here?



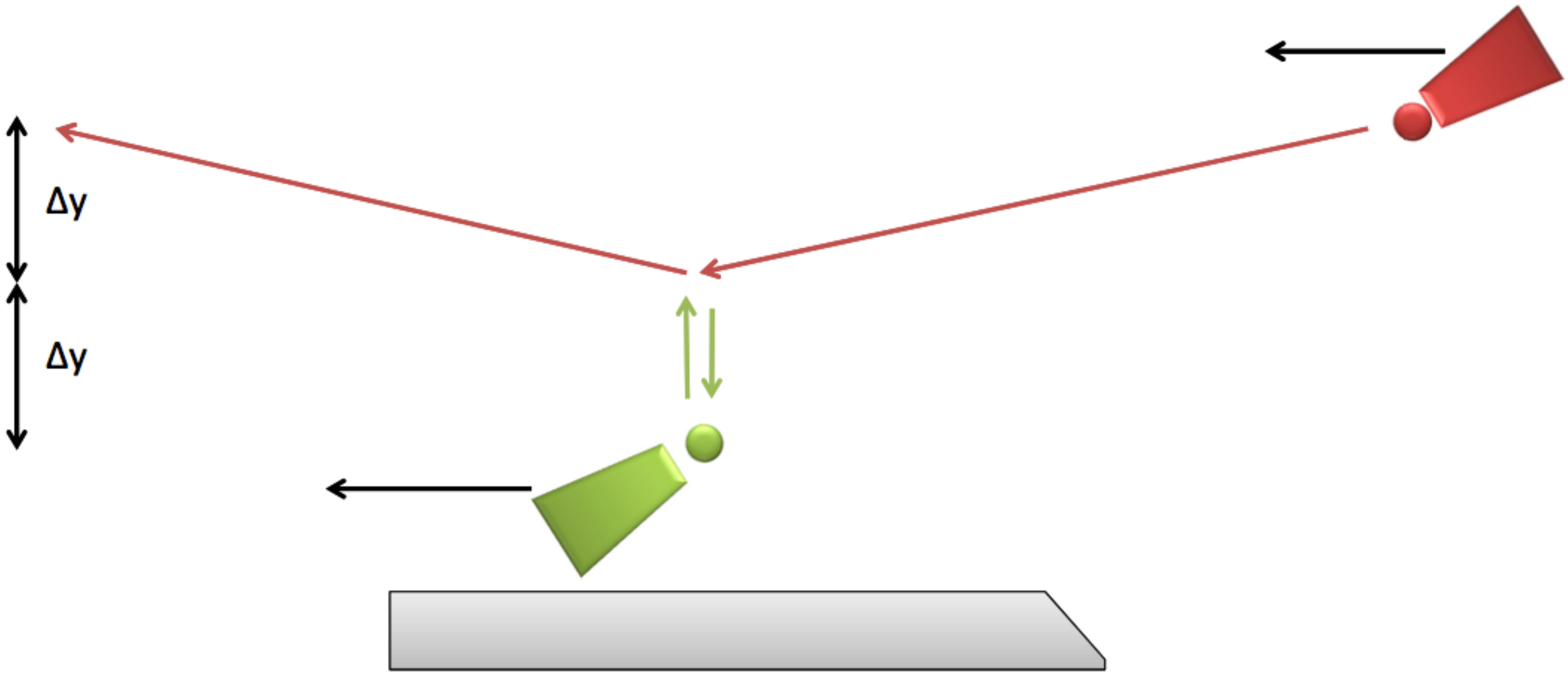
In the new frame, we can say that magnitude of M $\Delta y/\Delta t$:

A) Is greater for the red ball
B) Is greater for the green ball
C) Is the same for both balls



If Δt_{PROP} is the proper time for a ball between when it is fired and when it collides with the other ball, we can say that M ($\Delta y/\Delta t_{PROP}$):

A) Is greater for the red ball
B) Is greater for the green ball
C) Is the same for both balls



If Δt_{PROP} is the proper time for a ball between when it is fired and when it collides with the other ball, we can say that M ($\Delta y/\Delta t_{PROP}$):

A) Is greater for the red ball
B) Is greater for the green ball
C) Is the same for both balls

The proper time does not depend on what frame we are talking about, since it is the actual amount of time that passes on the ball's clock. Since the collision was completely symmetrical between the two balls in the first frame, the proper times must be the same.

Which of the following is NOT true of the relativistic formula for momentum $\vec{p} = \gamma m\vec{v}$?

A) It reduces to the old formula $\vec{p} = m\vec{v}$ for speeds much less than c.
B) For any object, there is no upper limit to the momentum it can have.
C) The relativistic momentum is the same in all frames of reference.
D) The sum of $\vec{p}$ for all objects is the same before and after any collision.

Which of the following is NOT true of the relativistic formula for momentum $\vec{p} = \gamma m\vec{v}$?

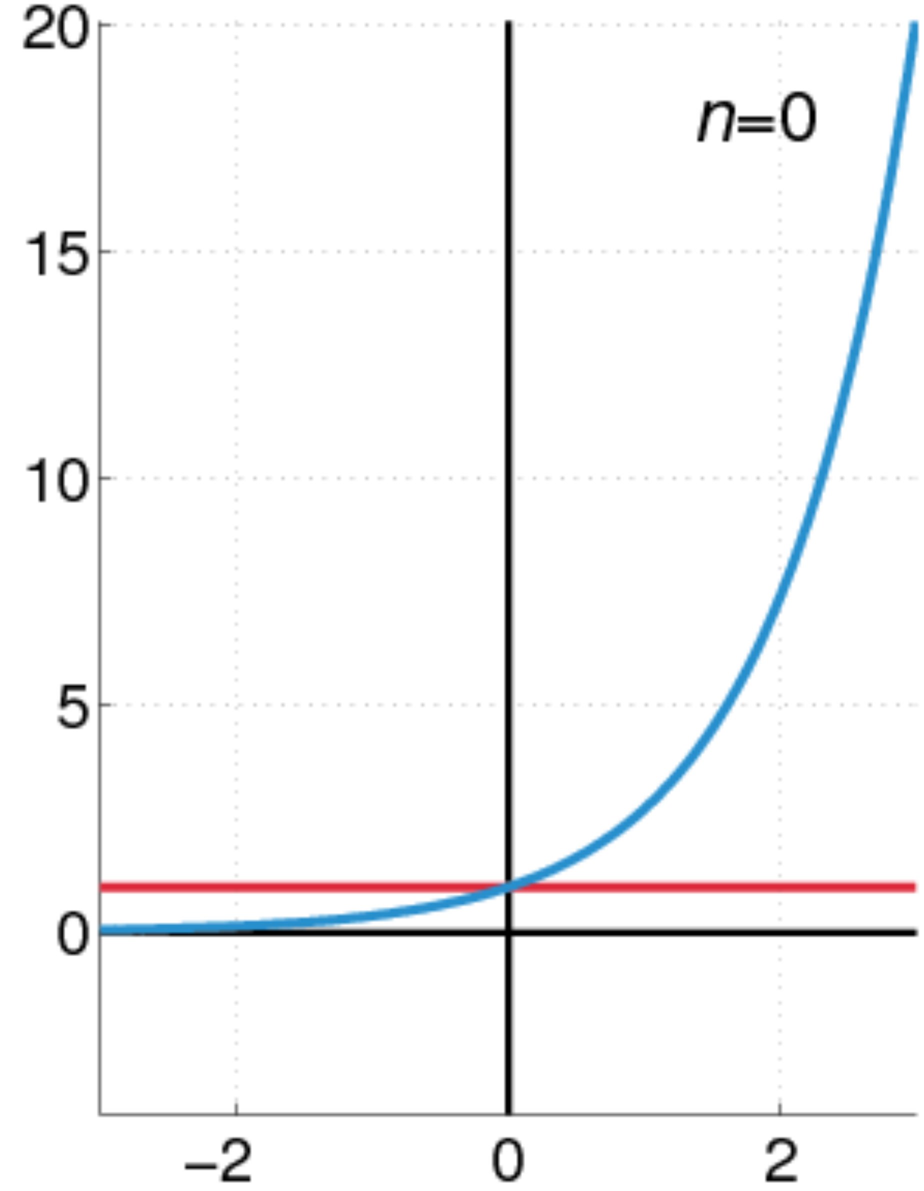
A) It reduces to the old formula $\vec{p} = m\vec{v}$ for speeds much less than c.

B) For any object, there is no upper limit to the momentum it can have.

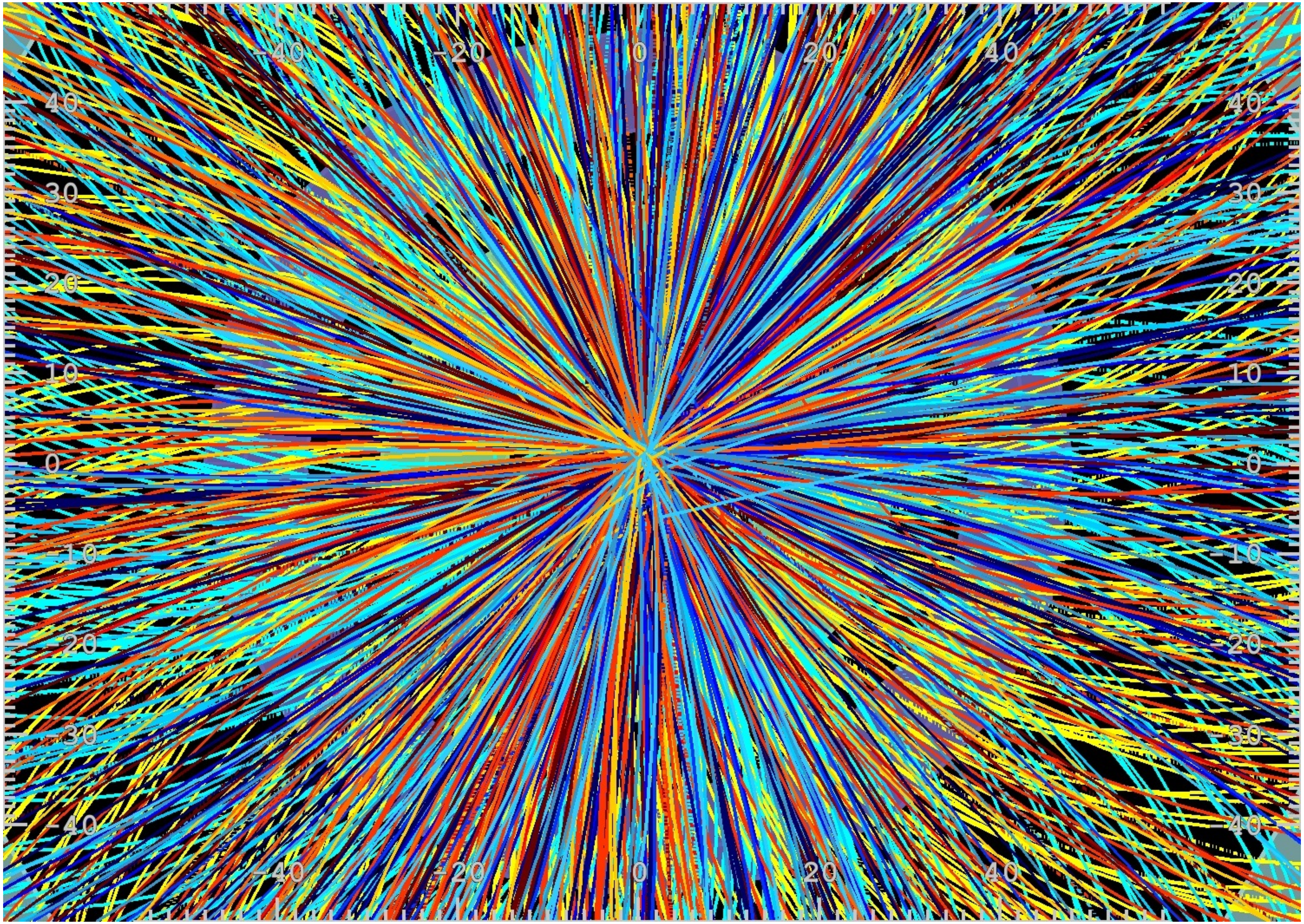
C) **The relativistic momentum is the same in all frames of reference.**

D) The sum of $\vec{p}$ for all objects is the same before and after any collision.

Approximating a Function Near a Point



Particle Physics



Cosmic Rays