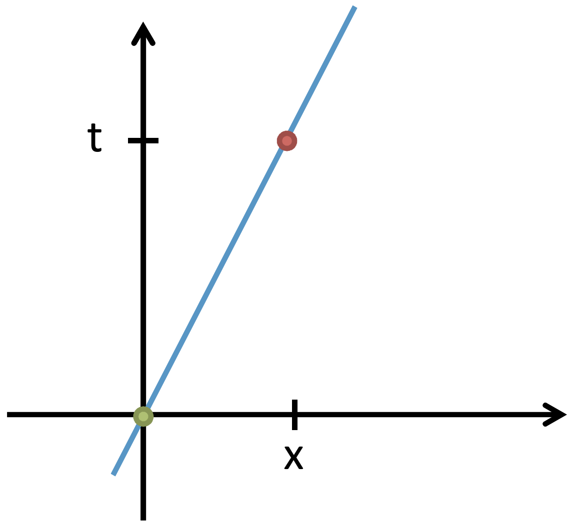
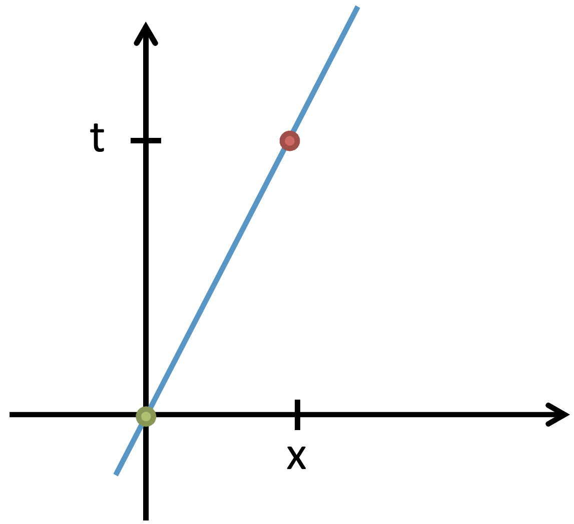


On the spacetime diagram shown, the blue line represents Superman flying at constant velocity. If this Superman's clock reads time 0 at the event marked by the green dot, what does his clock read at the event marked by the red dot? Answer in terms of x, t, and c only.

Extra: can you get the result in two separate ways, one using the invariant interval and one without?

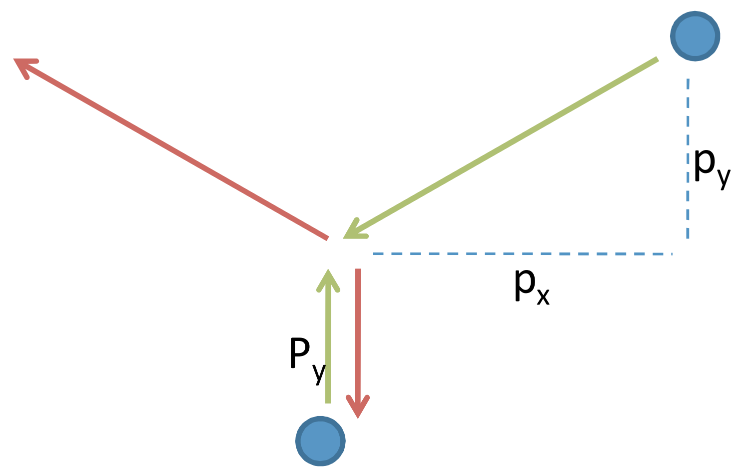


On the spacetime diagram shown, the blue line represents Superman flying at constant velocity. If this Superman's clock reads time 0 at the event marked by the green dot, what does his clock read at the event marked by the red dot?

Answer: the time will be the time elapsed between the two events in Superman's frame, the frame where both events are at the same place. Thus, the results is

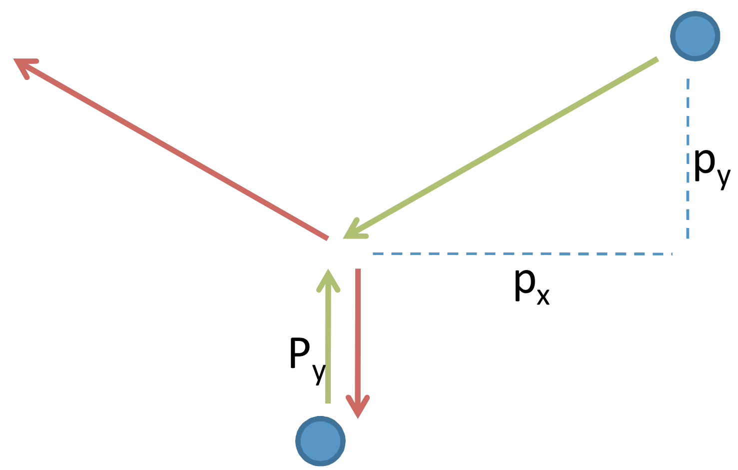
$$\frac{1}{c}\sqrt{-I} = \frac{1}{c}\sqrt{c^2 t^2 - x^2} = \sqrt{t^2 - x^2/c^2}$$

We get the same result by saying that the time is t/γ where γ is calculated using the velocity $v = x/t$



In the collision shown, we can say that

A) Momentum is not conserved
B) Momentum is conserved only if $|p_y| = |P_y|$
C) Momentum is conserved for arbitrary values of the momentum components shown



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In the new frame of reference, the travel time for cannonball A between firing and collision is

A) greater than the travel time for cannonball B

B) equal to the travel time for cannonball B

C) less than the travel time for cannonball B

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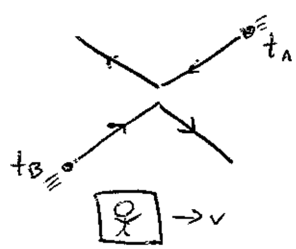

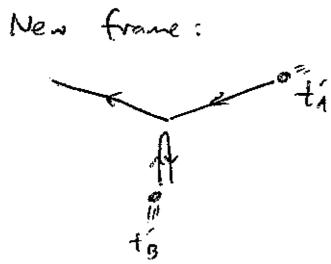

$t' = \gamma\left(t - \frac{v}{c^2}x\right)$

$t_A = t_B$ $x_A > x_B$

$\therefore t'_A < t'_B$