change +c to −c and the Lorentz equations still work

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2004−09/2252.html

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Date: 09/08/04

Date: 8 Sep 2004 07:30:02 −0700

Machine,

There is a reason why they still work. It has to do with the term
(t−vx/c^2) in the equation for t'. You need to decide if x is going to be ct or −ct. All you have here is a shortcut. If x is −ct, then your equation says
(t−v(−ct)/c^2), which is t+vct/c^2. This is a different process than the one you are using for a photon going in the +x direction where x=ct, and ,as you might notice, a longer time.

The original expression is (t−vt/c) in which c is the velocity of light, not the speed. Scientists changed it to (t−vx/c^2) so that they did not have to think about it, and they could just say c=speed of light.
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