

The notes below only include the fixed Lorentz transforms. The correction in each corrected equation is indicated in bold.

The Lorentz transforms should be:

$$t' = \gamma t - \frac{\gamma v}{c^2} x \quad (1a)$$

$$x' = \gamma x - \gamma v t \quad \text{in class I wrote a "+" instead of "-" in the second term} \quad (1b)$$

$$y' = y \quad (1c)$$

$$z' = z; \quad (1d)$$

the error was in Eq. (1b). The stuff about the vectors \vec{r}_1 and \vec{r}_2 was fine, the next error was:

$$x' = (-\gamma v \quad \gamma) \begin{pmatrix} t \\ x \end{pmatrix} \quad (2)$$

again, the mistake was writing a "+" instead of "-" in the γv term. This correction means the transform matrix L needs to change,

$$L = \begin{pmatrix} \gamma & -\frac{\gamma v}{c^2} \\ -\gamma v & \boldsymbol{+}\gamma \end{pmatrix} \quad (3)$$

so that

$$\begin{pmatrix} t' \\ x' \end{pmatrix} = \begin{pmatrix} \gamma & -\frac{\gamma v}{c^2} \\ -\gamma v & \boldsymbol{+}\gamma \end{pmatrix} \begin{pmatrix} t \\ x \end{pmatrix}. \quad (4)$$

Note that L_{rot} was correct as presented in class. I noticed the error in sign when we calculated the determinant,

$$\det L = \begin{vmatrix} \gamma & -\frac{\gamma v}{c^2} \\ -\gamma v & \boldsymbol{+}\gamma \end{vmatrix} = \gamma^2 - \left(-\frac{v\gamma}{c^2}\right)(-\gamma v) = \gamma^2 - \frac{v^2}{c^2}\gamma^2 = \gamma^2 \left(1 - \frac{v^2}{c^2}\right) = 1 \quad (5)$$