

59. To illustrate the technique, we derive Eq. 1' from Eqs. 1 and 2 (in Table 38-2). We multiply Eq. 2 by speed v and subtract it from Eq. 1:

$$\Delta x - v\Delta t = \gamma(\Delta x' + v\Delta t') - v\gamma\left(\Delta t' + \frac{v\Delta x'}{c^2}\right) = \gamma\Delta x'\left(1 - \frac{v^2}{c^2}\right)$$

We note that $\gamma(1 - v^2/c^2) = 1/\gamma$ (using Eq. 38-8), so that if we multiply the above equation by γ we obtain Eq. 1':

$$\gamma(\Delta x - v\Delta t) = \gamma\left(\gamma\Delta x'\left(1 - \frac{v^2}{c^2}\right)\right) = \Delta x'$$