Physics 267 Problem 7 Solutions

$\vec{V}_1 = \hat{i} V_1$ $\qquad$ $\vec{V}_2 = -\hat{i} V_2$

$V_1 = 0.8c$ $\qquad$ $V_2 = 0.5c$

In ship 1: earth approaches at $0.8c$

In ship 2: earth approaches at $0.5c$

Spaceship 2 in frame of Spaceship 1:

Make a velocity transformation,

$V_x = -0.5c$ - ship 2 in earth frame

$V = 0.8c$ velocity of reference frame.

$$V_x' = \frac{V_x - V}{1 - \frac{V V_x}{c^2}} = \frac{-0.5c - 0.8c}{1 - \frac{(0.8c)(-0.5c)}{c^2}}$$

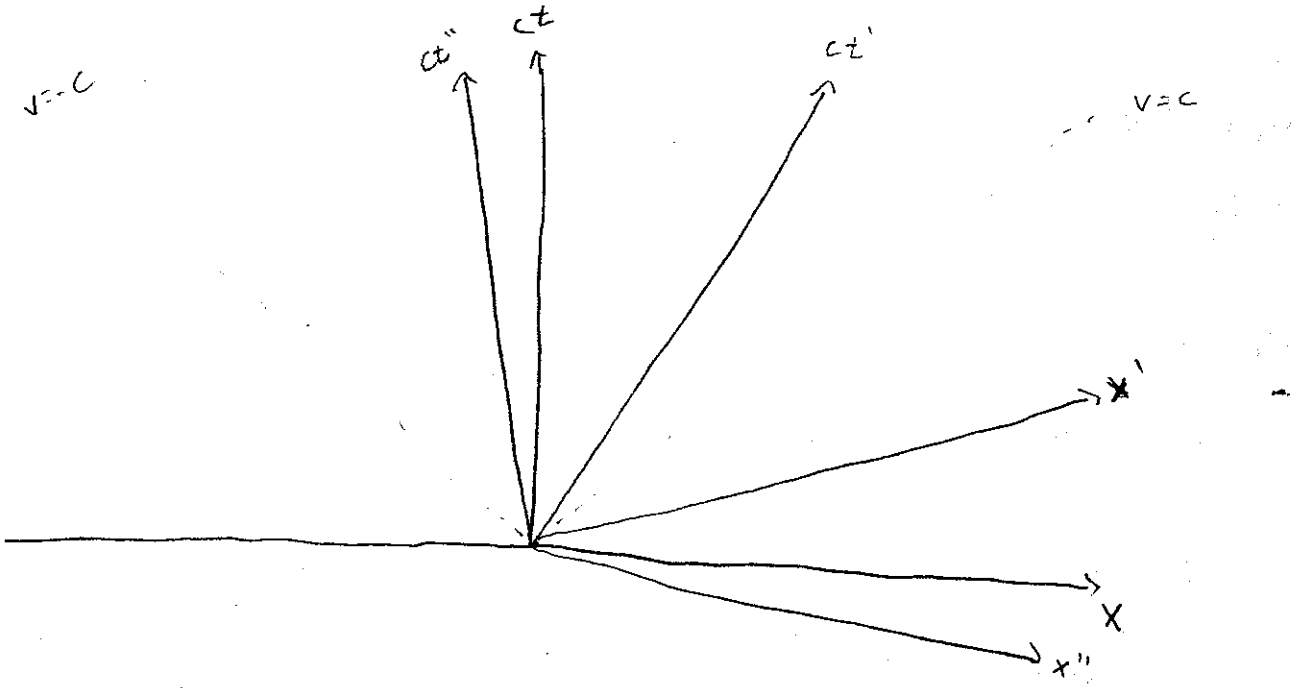
$$= c\left(\frac{-1.3}{1 + 0.4}\right) = -\frac{1.3}{1.4}\,c$$

Space ship 1 in frame of space ship 2:

$V_x = 0.8c$ ship 1 in earth frame

$V = -0.5c$ velocity of ref. frame.

$$V_x' = \frac{V_x - V}{1 - \frac{V V_x}{c^2}} = \frac{0.8c - (-0.5c)}{1 - \frac{(-0.5c)(0.8c)}{c^2}} = \frac{1.3}{1.4}\,c$$



x', ct' : spaceship 1

x'', ct'' : spaceship 2