PHYS 113/ HW #5 sol

#1] $t_0 = 0$

$t_F = 2s$

$V = .9c$

$X = c/2$

$\gamma = (1 - v^2/c^2)^{-1/2} = 2.29$

$t_F' = \gamma(t_F - \frac{vx}{c^2}) = 3.56s$ part c

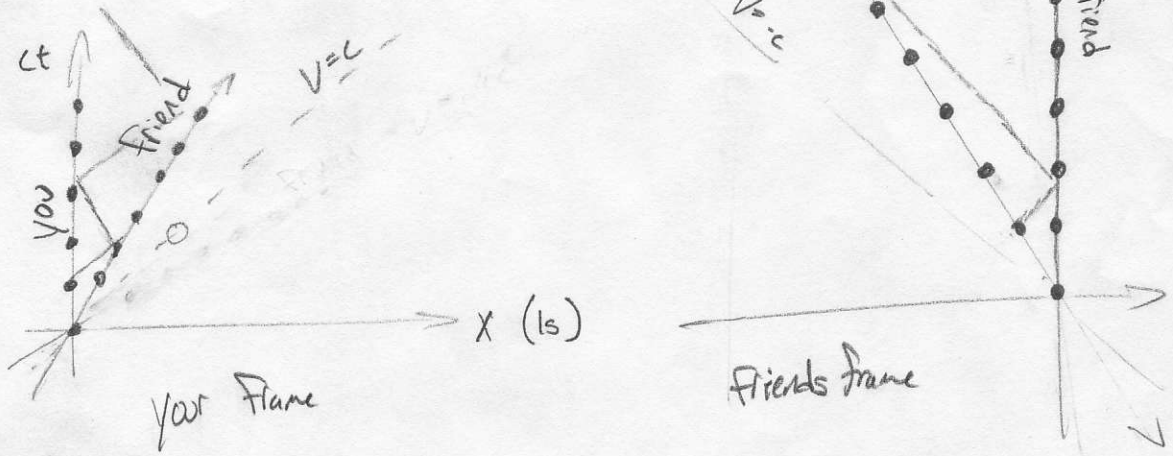
assuming the bird does not have any $\vec{a}$

$U = \frac{c/2}{2} = 1/4\ ls/s$ part a

$x' = \gamma(x - vt) = -3.0\ ls$ part a

$U' = \frac{U - V}{1 - \frac{uv}{c^2}} = \frac{-.65}{.775} = -.84c$

#2]



c] $x' = 10m \cdot \frac{1\ ls}{3 \cdot 10^8\ m} = 3.3 \cdot 10^{-8}\ ls$

$V = 1/2\ c \quad \gamma = 1.155$

$x = \frac{x'}{\gamma} + \cancel{vt}^{\,\to 0} = 2.87 \cdot 10^{-8}\ ls = 8.6m$

d,e] both parts must of same answer of $t = t' = \gamma(1) = 1.15s$

#3]

$M_n = 1.6749 \cdot 10^{-27}$ kg

$E_{rest} = mc^2 = 1.507 \cdot 10^{-10}$ J

$n \rightarrow p + e^- + \bar{\nu}$

$\Delta m = (1.6726 \cdot 10^{-27} + 9.11 \cdot 10^{-31}) - m_n$

$= -1.389 \cdot 10^{-30}$ kg mass lost

$c^2(M_p + m_{e^-}) = 1.506 \cdot 10^{-10}$ J

$\Delta E = E_{kin} = 1.25 \cdot 10^{-13}$ J

$\frac{2}{10} E_{kin} = 2.5 \cdot 10^{-14}$ J $= M_e c^2 \gamma - M_e c^2$

$\gamma = \frac{(\frac{2}{10}) E_{kin}}{m_e c^2} + 1 = 1.3$

$\gamma = (1 - v^2/c^2)^{-1/2} \rightarrow v = .64c$

$= 1.9 \cdot 10^8$ m/s