

Ex 8.5. (relativistic hockey)

a). The position of the puck according to  $K_0$  is

given by  $x_0(t_0) = 0$  and

$$y_0(t_0) = ut_0, \quad u = \frac{8}{10}c, \quad \text{so}$$

$$\boxed{y_0(t_0) = \frac{8}{10}ct_0}$$

• Since the puck is moving perpendicular to the motion of  $K_1$ , the coordinates

$$y_1 = y_0 \quad \text{or} \quad y_1 = ut_0$$

• To write this in terms of  $K_1$ 's proper time, we need  $y_1(t_1)$ , so we need to express  $t_0$  in terms of  $t_1$ . This is done via the Lorentz transform,

$$t_1 = \gamma \left( t_0 - \frac{vx_0}{c^2} \right) =$$

• Since  $\boxed{x_0 = x_1 = 0}$ ,  $t_1 = \gamma t_0$ .

$$\text{where } \gamma = \frac{1}{\sqrt{1 - \left(\frac{8}{10}\right)^2}} = \frac{5}{3}$$

• Thus we write  $y_1(t_1) = u \frac{t_1}{\gamma} = \frac{\frac{8}{10}c}{\frac{5}{3}} t_1$

$$\text{or } \boxed{y_1(t_1) = \frac{12}{25}ct_1}$$