5. Relativistic Addition of Velocities.

What is the unknown?

The relationship between u_x, u_x', and V.

$$u_x = \frac{dx}{dt} = \frac{d}{dt'}(\gamma(x' + Vt')) \frac{dt'}{dt}$$

$$u_x = \gamma\left(\frac{dx'}{dt'} + V\frac{dt'}{dt'}\right)\frac{dt'}{dt}$$

$$u_x = \gamma(u_x' + V) \cdot \frac{1}{\frac{dt}{dt'}}$$

$$u_x = \frac{u_x' + V}{1 + \frac{V}{c^2} \cdot u_x'}$$

$$\frac{dt}{dt'} = \gamma \frac{d}{dt'}\left(t' + \frac{Vx'}{c^2}\right)$$

$$= \gamma\left(1 + \frac{V}{c^2} \cdot \frac{dx'}{dt'}\right)$$

$$= \gamma\left(1 + \frac{V}{c^2} \cdot u_x'\right)$$