

A particle is traveling along a line making 30° with the x axis in \mathcal{S} , at ordinary speed $(1/\sqrt{5})c$.

- (a) Find the component u_x and u_y of the ordinary velocity.
- (b) Find the components η_x and η_y of the proper velocity.
- (c) Find the zeroth component of the 4-velocity, η^0 .

System $\bar{\mathcal{S}}$ is moving in the x direction with ordinary speed $(1/\sqrt{5})c$, relative to \mathcal{S} . By using the appropriate transformation laws:

- (d) Find the ordinary velocity components \bar{u}_x and \bar{u}_y in $\bar{\mathcal{S}}$.
- (e) Find the proper velocity components $\bar{\eta}_x$ and $\bar{\eta}_y$ in $\bar{\mathcal{S}}$.
- (f) As a consistency check, verify that

$$\bar{\eta} = \frac{\bar{u}}{\sqrt{(1 - \bar{u}^2/c^2)}}$$