

[lex168] Observing a rod in transverse motion

Consider a rod of proper length $\ell_0 = 1\text{m}$ oriented in x -direction in frame \mathcal{F} with its center at position $x = 0$, $y = ut$, where $u = \text{const}$. Frame \mathcal{F}' moves in positive x -direction relative to frame \mathcal{F} with constant velocity v . Clocks in the two frames are synchronized at $t = t' = 0$ when their origins coincide. Determine the times when the two ends of the rod cross the x' -axis and infer from this information the length of the rod in frame \mathcal{F}' and its orientation in the (x', y') -plane.

Solution: