Special Relativity
Homework, Set 4

1. Using the spacetime diagram of the S' observer (i.e., a diagram in which the x' and t' axes are perpendicular), demonstrate (a) relativity of simultaneity, (b) time dilation, and (c) length contraction.

2. Observers A and B are situated at opposite ends of a train moving with speed β relative to two stationary observers C and D. Suppose that, to the observers C and D, the passing of C by A (call this event AC) is simultaneous with the passing of D by B (event BD). By the relativity of simultaneity, AC and BD are not simultaneous in the train reference frame. (a) Use a spacetime diagram of observer A to determine which event is earlier in the train reference frame. (b) Show that the same conclusion can be drawn from a spacetime diagram of observer C.