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Physics 3710 – Problem Set #2

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Problems 1-4 refer to: Sound travels at about 330 m/s in still air. Observer O is at rest with respect to still air, observer O' travels with constant velocity +50 m/s in the common x, x' direction. Event A is the emission of a sound pulse from a stationary source at the origin of O; it occurs at $x_A = 0$ at $t_A = 0$. Event B is the reflection of the pulse at $x_B = +100$ m. Event C is the detection of the reflected pulse at $x_C = 0$. Assume the axes and clocks of O and O' are set up so that the Newtonian transformation rules in BK2 apply. Explain all answers.

1. Sketch an s-t diagram for O with these three events on it. Sketch an s-t diagram for O' with these three events on it.
2. What are the times t_B and t_C ? What are the times t'_B and t'_C ?
3. What are the positions x'_B and x'_C ?
4. What total distance does the pulse travel from A to B and from B to C according to O'? How does O' "reconcile" the answers to problem 2 with these distances?