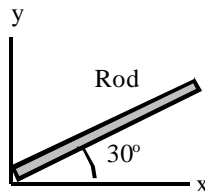


Modern Physics

Fall 2018

Extra Questions on Relativity

(I may add more questions later)

- I am at rest in frame A and I measure the length of an object to be 2m. A person in another frame (B) measures its length to be 1.5m. In a third frame, D, its length is measured to be 3m.
 - If one of these frames is the rest frame of the object, which is the rest frame? **(Give a reason for your choice!)**
 - Which frame is moving the fastest relative to the rest frame and what is its speed?
- Two events occur in my frame, frame A, $1\mu\text{s}$ apart. They are at $x = 0$ and $x = 200\text{m}$, the one at 0m occurring first in my frame. A person in another frame, frame B, is moving in the $-x$ direction relative to me with a speed of $0.8c$.
 - What is the time interval between the events in frame B, i.e. Δt_B ?
 - How far apart are they in frame B, i.e. Δx_B ?
 - If there is a third frame, frame D moving with a speed of $0.8c$ in the $+x$ direction relative to frame A, what would Δx_D and Δt_D be for that frame?
- A meter stick is making an angle of $\theta = 30^\circ$ with respect to the x axis in my frame, A, and is at rest in my frame. Another frame, B, is moving in the $+x$ direction with a speed of $v = 0.6c$ relative to my frame. What angle does the rod make with respect to the x axis in frame B? (Assume the x axis in B is parallel to the x axis in A.) Hint: What appears to change in frame B, the Δx_B , the Δy_B , or both?
- In frame A two events occur and they are 400m apart and the time interval (in A) is $2\mu\text{s}$.
 - Is there a frame where they occur at the same place? **(Explain!)**
 - Is there a frame where they occur at the same time? **(Explain!)**
 - If there is a yes to either or both of these, what is the velocity of that frame with respect to A?
- In frame A two events occur and they are 400m apart and the time interval (in A) is $1\mu\text{s}$.
 - Is there a frame where they occur at the same place? **(Explain!)**
 - Is there a frame where they occur at the same time? **(Explain!)**
 - If there is a yes to either or both of these, what is the velocity of that frame with respect to A?

