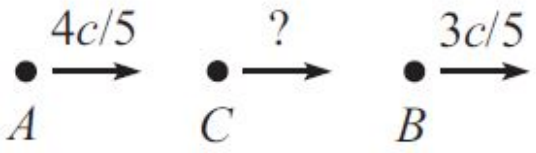
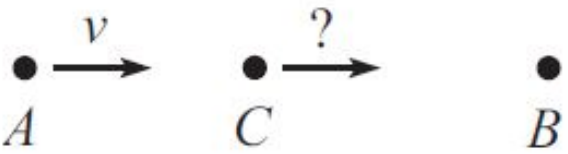
Physics IV
ISI B.Math
HW set 1
Marks :25



1. A and B travel at $4c/5$ and $3c/5$ with respect to the ground, as shown in the figure. How fast should C travel so that she sees both A and B approaching her at the same speed ? What is this speed ?(5)



2. A travels at a speed v with respect to the ground, and B is at rest, as shown in the figure. How fast should C travel so that she sees A and B approaching her at the same speed ? In the ground frame (B's frame), what is the ratio between the distances CB and AC (assume that A and C arrive at B at the same time)?(5)

3. By this time you must be tired of trains and balls being thrown on them, but here is yet another one. A train with proper length L moves with speed $c/2$ with respect to the ground. A ball is thrown from the back to front at a speed $c/3$ with respect to the train. How much time does this take, and what distance does the ball cover in
(a) the train frame ?(1)
(b) the ground frame ? Solve this by
(i) using a velocity addition argument(2)
(ii) Using the Lorentz transformations to go from the train frame to the ground frame.(2)
(c) the ball frame?(1)
(d) Verify that the invariant interval is indeed the same.(3)
(e) Show that the times in the ball frame and the ground frame are related by the relevant γ factor.(2)
(f) Show the same thing as (e) for the ball frame and train frame(2)
(g) Show that the times on the train frame and the ground frame are NOT related by the relevant γ factor. Why not ?(2)