PHYS 200: Problem Set IV

Due: 4:30 pm March 1, 2005

1. [3] Using the Lorentz transformation, prove that the spacetime interval $s^2 = (ct)^2 - x^2$ is invariant.

2. [5]

   (a) For $x = 3.00$ and $y = 8.00$, calculate the path length ABC and compare with the path length AC in Euclidean space, shown in figure 1.

   (b) For $x = 3.00$ and $ct = 8.00$, calculate the path length ABC and compare with the path length AC in Minkowski space, shown in figure 2.

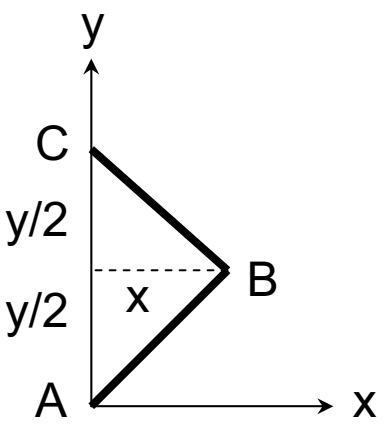

Figure 1

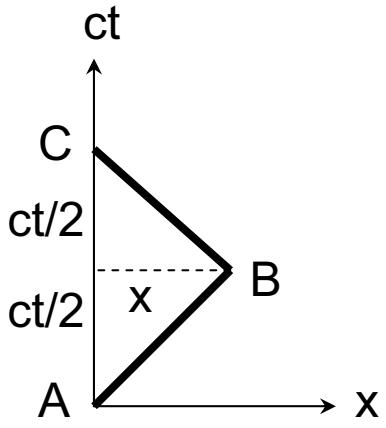

Figure 2

3. [5] A friend of yours who is the same age as you travels at $0.999c$ to a star 15 light-years away. She spends 10 yr on one of the star's planets and then returns at $0.999c$. How long has she been away

   (a) as measured by you and

   (b) as measured by her?