

DUE: Thursday, February 4,
at the beginning of class

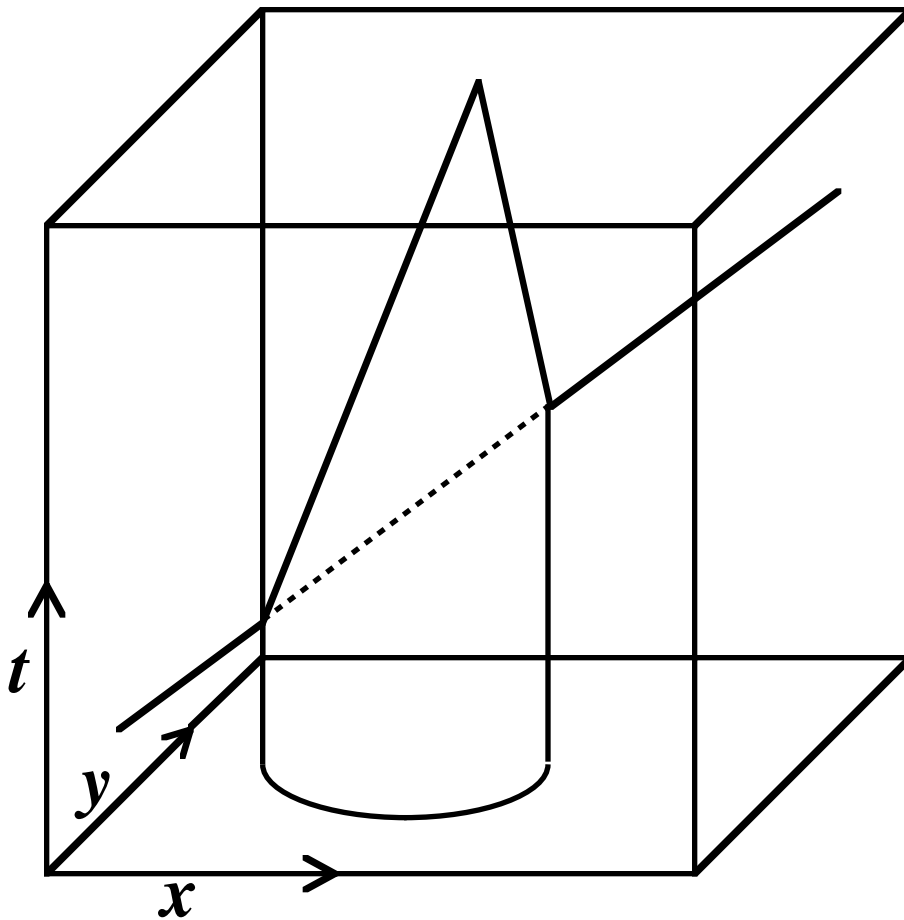
SPAC 205

Problem Set #1

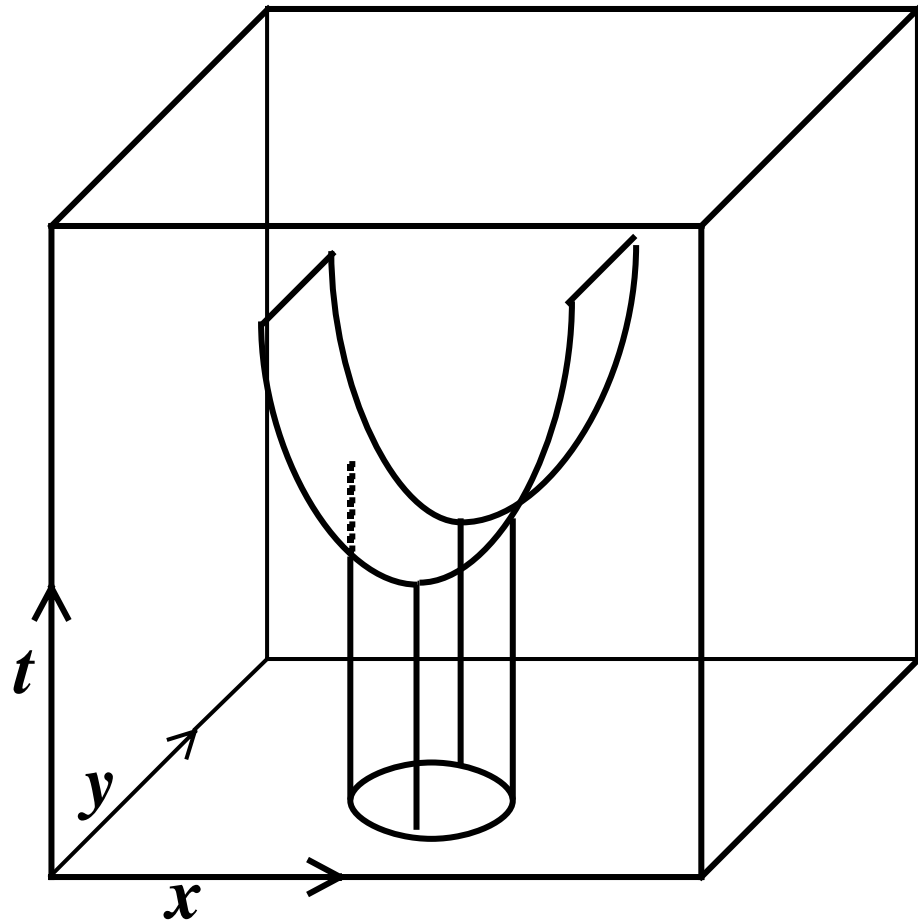
NAME: _____

I. DESCRIBE, IN SUFFICIENT DETAIL, WHAT IS GOING ON IN THE FOLLOWING “ARISTOTELIAN” SPACE-TIME DIAGRAM:

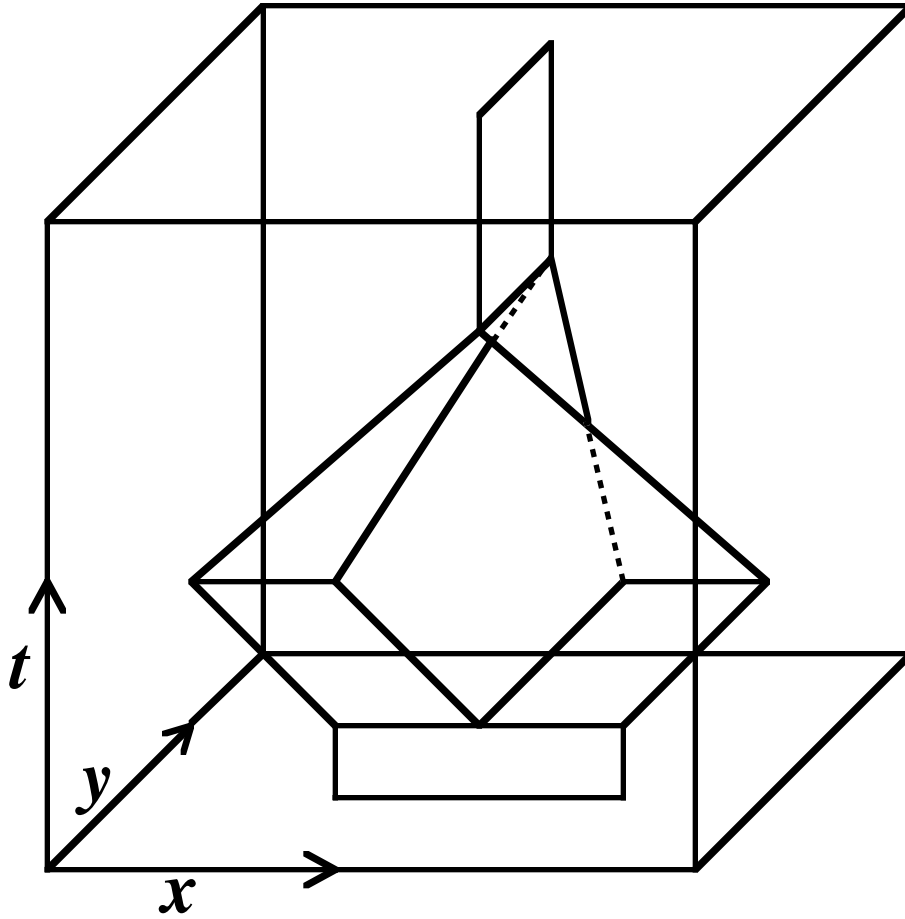
1. “Balloon and bullet” (5 points)



2. "Rope" (5 points)

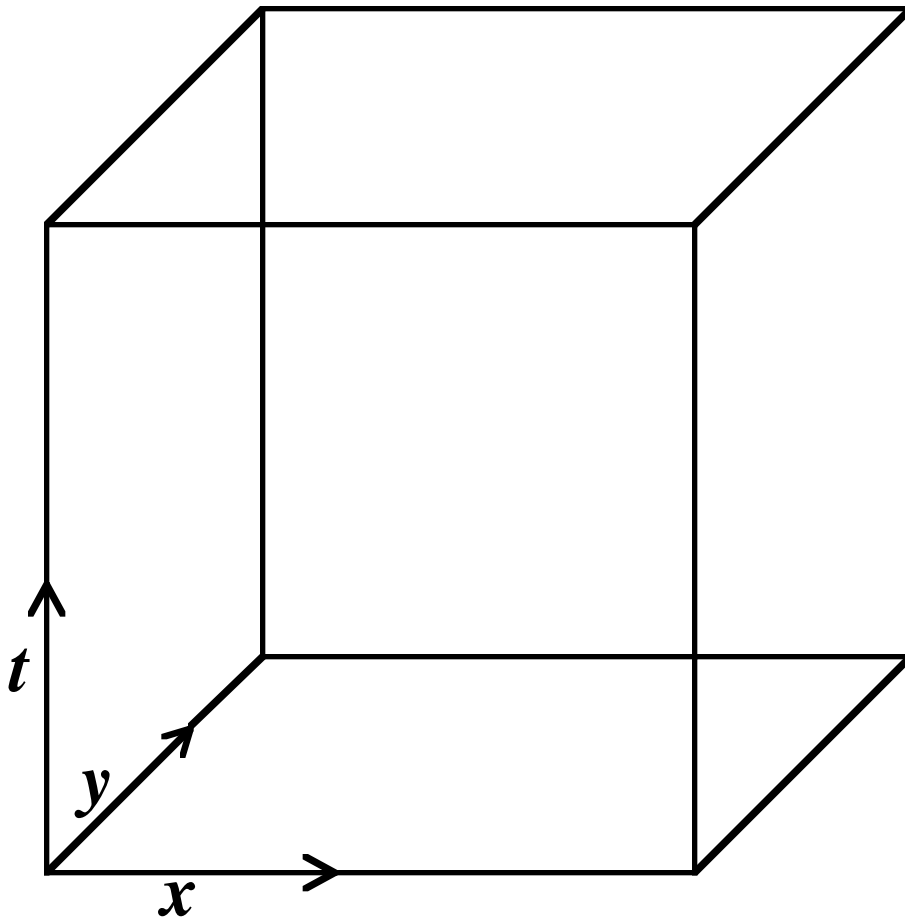


3. "Stick" (10 points)

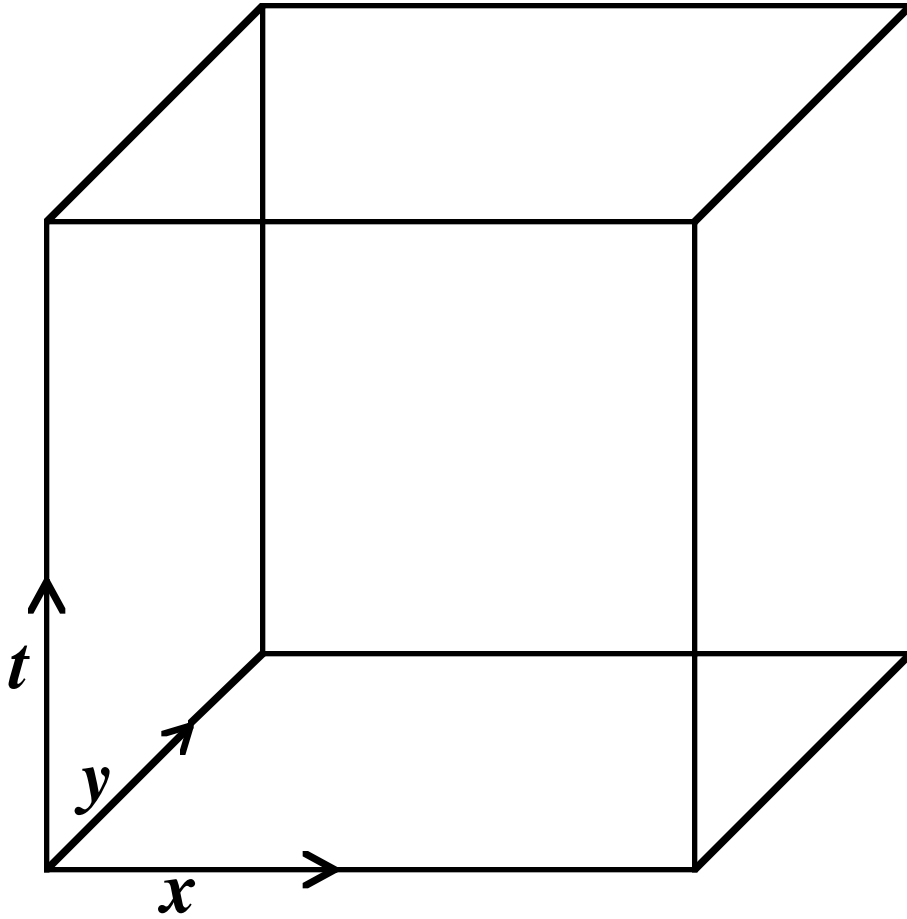


**II. PROVIDE “ARISTOTELIAN” SPACE-TIME DIAGRAM
FOR THE FOLLOWING PHYSICAL SITUATIONS:**

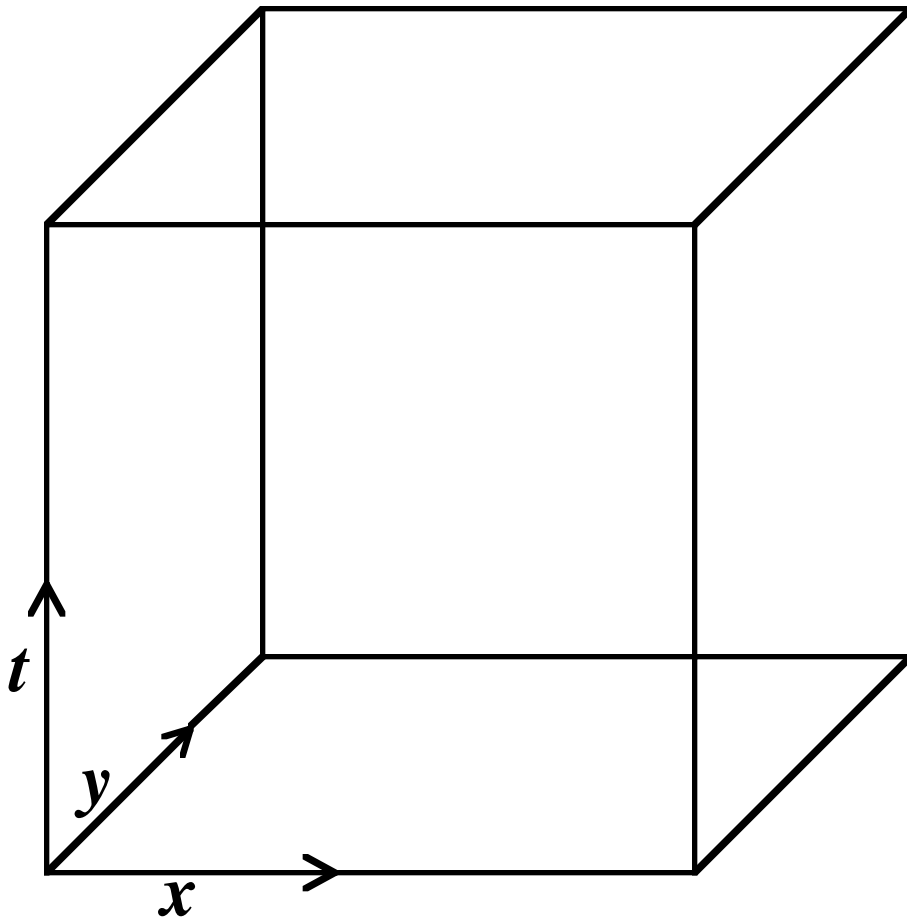
4. A firecracker explodes sending out a spherical pulse of light and also a spherical pulse of sound. Please use two different colors. (10 points)



5. A pendulum swings through a complete cycle. (10 points)

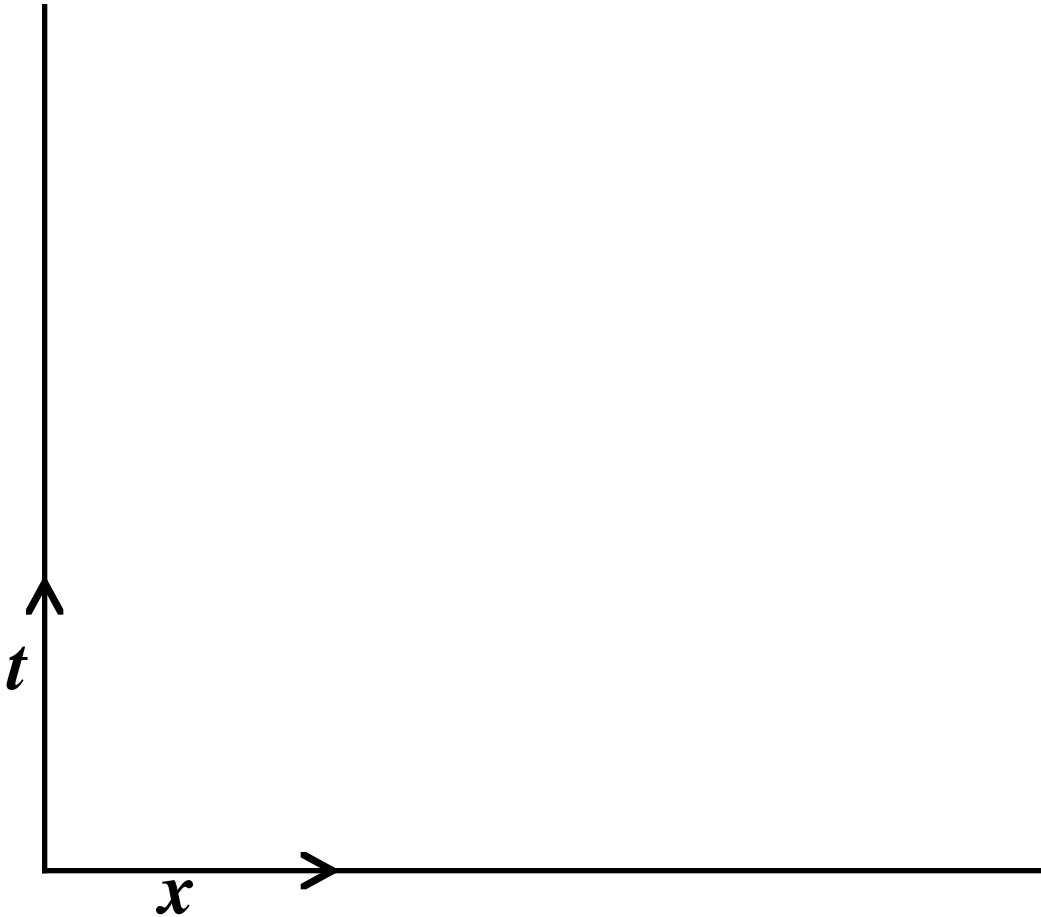


6. A handkerchief spread flat in the x - y plane slides uniformly in the direction of one of its diagonals. (10 points)

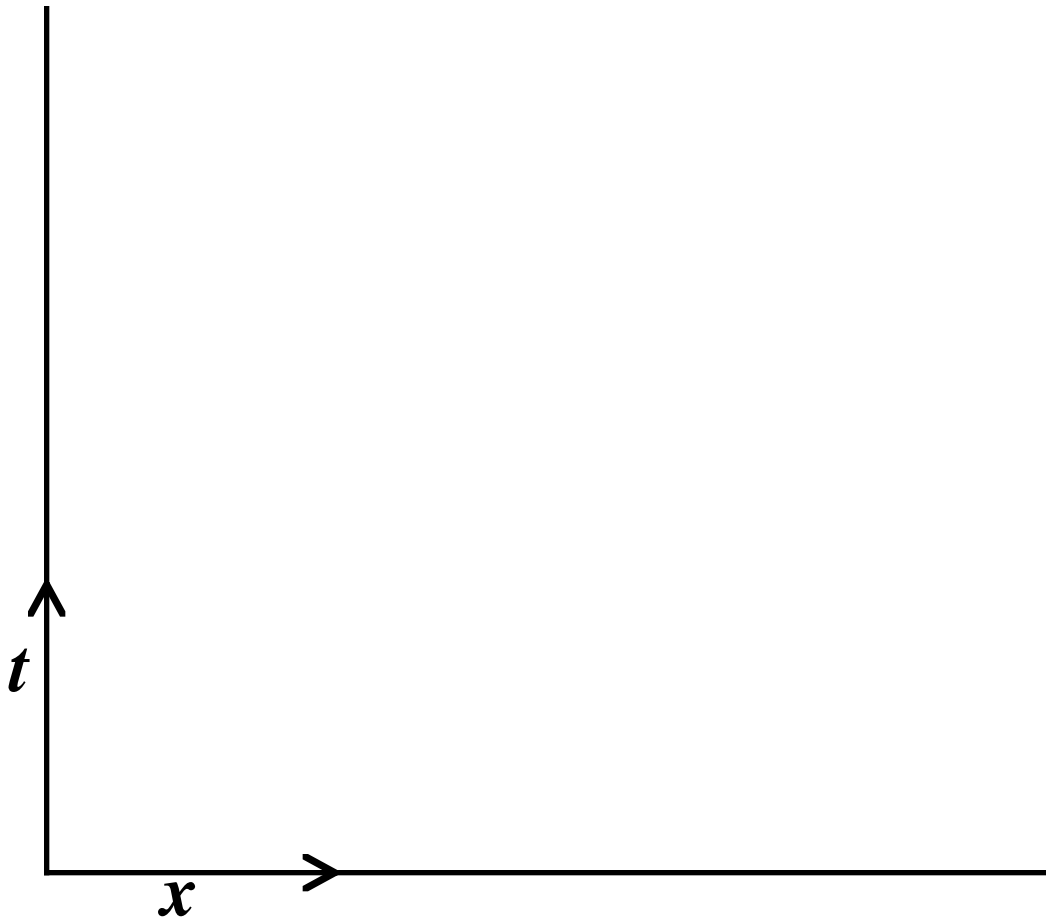


7. Cars A and B are moving with the same speed on a highway, B somewhat ahead of A; then A accelerates and passes B; then B accelerates and passes A; in-between, car C moving always with constant speed, passes both A and B. Draw two diagrams: (a) from the point of view of an observer at rest; (b) from the point of view of C. Please use three different colors, one for each car.

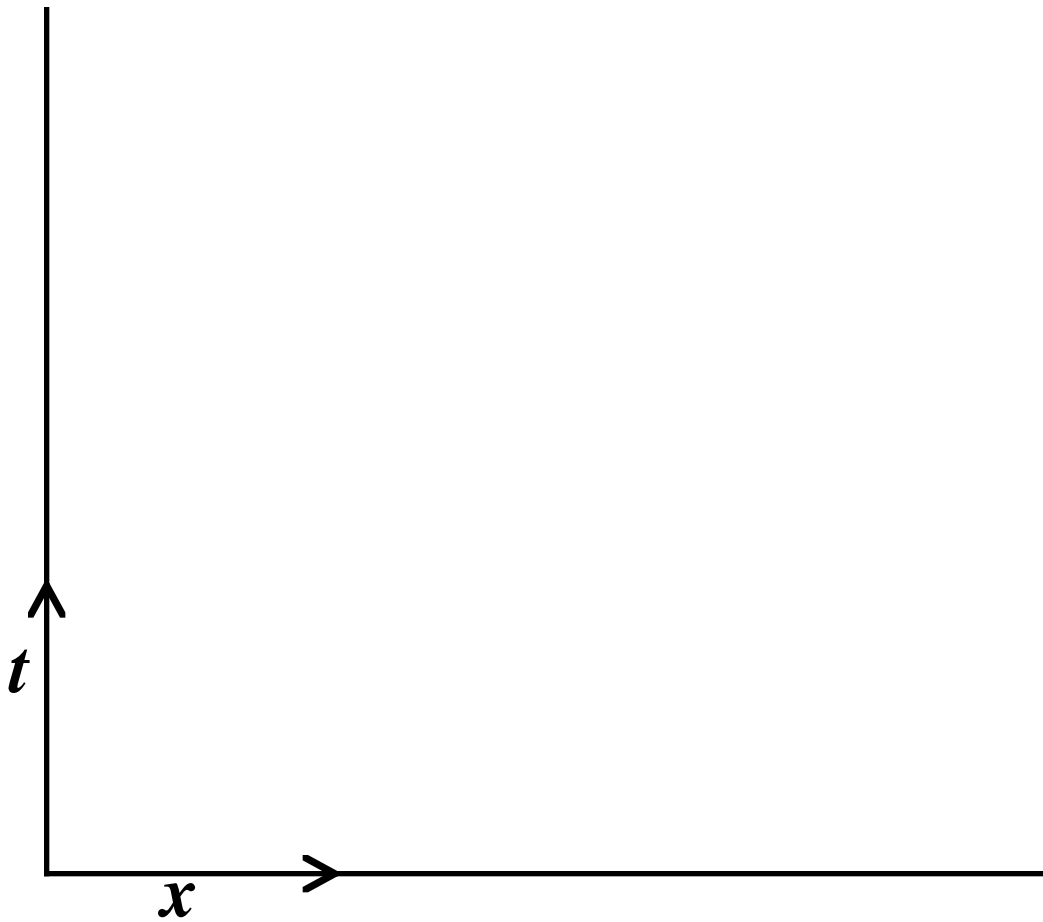
(a) From the point of view of an observer at rest (10 points)



(b) From the point of view of car C (10 points)



8. A bit of fluff and an elastic ball are dropped together (and strictly vertically, i.e., along the x -axis) on the floor. The ball, of course, is the first to reach the floor. Eventually both come to rest at the same point on the floor (the fluff first and the ball second, after several bounces). Please use three different colors (for fluff, ball, and floor). (10 points)



9. A flashlight sends short (but not instantaneous) regular pulses on two small objects, A and B, which are a certain distance apart and moving with the same constant velocity (which is a considerable fraction of the speed of light) away from the light source. As a result, there is no time at which none of the objects is illuminated and there is no time at which both are illuminated. (20 points)

