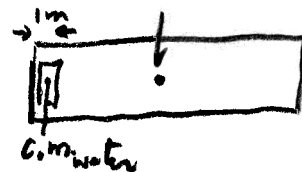3. A boxcar of length 8 m is at rest on horizontal frictionless rails. Inside the boxcar, whose mass is 3200 kg, a massless tank containing 2400 kg of water is located at the left-hand end. The tank is 1 m long. In this problem we worry only about the horizontal coordinate, and we ignore all effects of friction.

A. (5 pts) The center of mass of this system is located

(a) 9 m to the right of the left-hand end of the boxcar, and 1.2 m up from the floor.

**(b) 2.5 m to the right of the left hand end of the boxcar.

(c) At the middle of the boxcar.

(d) 2.28 m to the right of the left hand end of the boxcar.

If LH end of car is at

$$x_{c.m.} = 0.5\,m, \quad x_{c.m.car} = 4$$

water

$$X = \frac{x_{water}\,M_{water} + x_{car}\,M_{car}}{M_{water} + M_{car}}$$

B. (5 pts) At some point, the walls of the tank start to leak and the water spreads out of the boxcar uniformly. Assuming that all the water stays in the boxcar, does the breakage of the tank manifests itself to an outside observer standing outside the sy

**(a) The boxcar moves to the left a little and comes to

(b) The boxcar moves to the left and since there are no outside forces acting on continues to move to the left.

(c) There is no external clue as to what has happened

(d) The boxcar moves to the right.

all forces are internal. No way to move the c.m., which starts at rest. Since in leaking out the water move right, the car has to move left to leave the c.m. unchanged. Once the water is spread as much as it going to be, all comes to rest again