12/12

PHSX 343: Assignment 1

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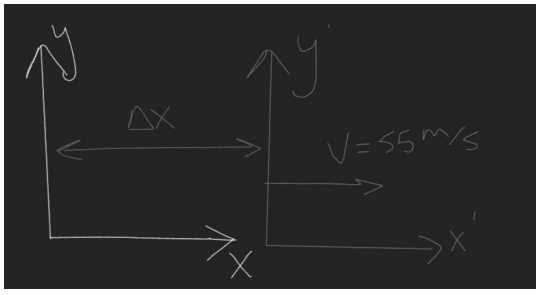
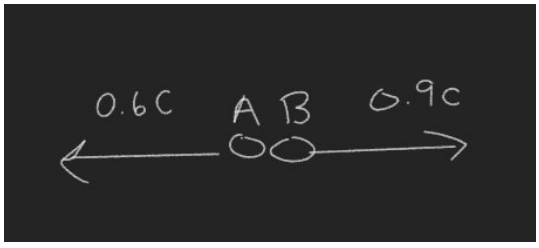
+4 Problem 1



$\Delta x = (55m/s)(15s) = (825m)$
$S = 1km$
$S' = 1km - 0.825km = 0.175km.$
We are in the non-relativistic realm, so the time doesn't fluctuate. So for both frames $t = 15s$.

+4 Problem 2



$V_A = -0.6c$ and $V_B = 0.9c$
In the reference frame of B: $V'_A = V_A - V_B = -1.5c$
In the reference frame of A: $V'_B = V_B - V_A = 1.5c$

$V'_B = -V'_A = 1.5c$
The speed of the two particles are the same, but the direction are opposite.

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Problem 3

Problem 1(a)

$P_{tot,i} = (0.750kg)(10m/s) + 0$ and $P_{tot,f} = 0 + (0.750kg)(10m/s)$
$P_{tot,i} = P_{tot,f}$, so total momentum is conserved in the boat's frame.

Problem 1(b)

"Explicitly show" means give a number.

If we name the puck initially moving as A and the other puck B:
Before the collision: $V_A = 7m/s$ and $V_B = 17m/s$
After the collision: $V_A = 17m/s$ and $V_B = 7m/s$

$P_{tot,i} = (0.750kg)(17m/s) + (0.750kg)(7m/s)$ and $P_{tot,f} = (0.750kg)(7m/s) + (0.750kg)(17m/s)$
$P_{tot,i} = P_{tot,f}$, so total momentum is conserved in the boat's frame.