Phys. 101 - Sec # 2 (Ch. 9 & 10)

Name: Key ID # SN#

1- Blocks A and B move toward each other along the x axis. A has a mass of 2.0 kg and a speed of 10 m/s; B has a mass of 3.0 kg and a speed of –5.0 m/s. They suffer an elastic collision and go off along the same axis. a) What are the **velocities** of both objects A & B after collision?

$\vec{P}_i = \vec{P}_f$

$2(10)\hat{i} - 3(5)\hat{i} = 2\vec{v}_{1f} + 3\vec{v}_{2f}$

$\boxed{5\hat{i} = 2\vec{v}_{Af} + 3\vec{v}_{Bf}}$ (1)

$K_i = K_f$

$\frac{1}{2}(2)(10)^2 + \frac{1}{2}(3)(5)^2 = \frac{1}{2}(2)v_{Af}^2 + \frac{1}{2}(3)v_{Bf}^2$

$\Rightarrow 200 + 75 = 2v_{1f}^2 + 3v_{2f}^2$

$\boxed{275 = 2v_{Af}^2 + 3v_{Bf}^2}$ (2)

solving both (1) & (2)

$\Rightarrow v_{Af} = (-8\ m/s)\,\hat{i}$

$v_{Bf} = (7\ m/s)\,\hat{i}$

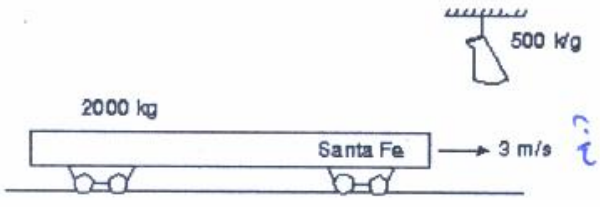
b) What is the speed of their center of mass **before** and **after** collision? $(v_{com})_i = (v_{com})_f$ it is the same

$(v_{com})_i = \frac{(P_{tot})_i}{M_{tot}} = \frac{2(10)\hat{i} - 3(5)\hat{i}}{2+3} = \frac{(20-15)\hat{i}}{5} = 1\,\hat{i}$

$= (V_{com})_f$

2- A 500-kg object is dropped on a 2000-kg railroad flatcar which was initially moving at 3 m/s as shown. After the object rests on the flatcar, what is the speed of the flatcar?

$\vec{P}_i = \vec{P}_f$



$(2000)(3)\hat{i} = (2500)\vec{v}_f$

$v_f = \frac{6000}{2500} = (2.4\ m/s)\,\hat{i}$