

Physics 200B Assignment 9

1. S+J Ch. 9 problem 24

a) initial situation: $\rightarrow 5 \text{ m/s}$ $\rightarrow 3 \text{ m/s}$ $\leftarrow 4 \text{ m/s}$
 $\boxed{4 \text{ kg}}$ $\boxed{10 \text{ kg}}$ $\boxed{3 \text{ kg}}$

(choose $\rightarrow +x$) final situation: $\rightarrow v_f$ $\boxed{17 \text{ kg}}$ stick together

momentum conservation: $\vec{p}_i = \vec{p}_f$ and

$$\vec{p}_i = (4 \text{ kg})(5 \text{ m/s}) + (10 \text{ kg})(3 \text{ m/s}) + (3 \text{ kg})(-4 \text{ m/s})$$
$$= +38.0 \text{ kg}\cdot\text{m/s}$$

$$\vec{p}_i = \vec{p}_f \Rightarrow 38 \frac{\text{kg}\cdot\text{m}}{\text{s}} = (17 \text{ kg}) v_f \Rightarrow v_f = +2.24 \text{ m/s}$$

(2.24 m/s \rightarrow)

b) The details of what happens between the initial and final situations aren't important as long as no net outside force changes the total momentum of the system of three carts, so the order of collision doesn't matter.