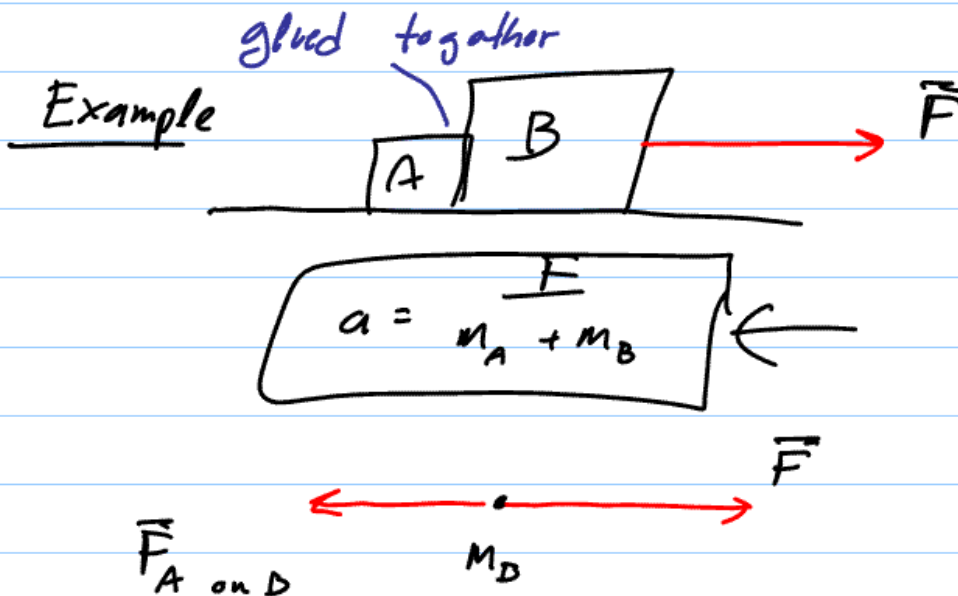


PHY138 - Mechanics - Class 9 - Oct 11/06

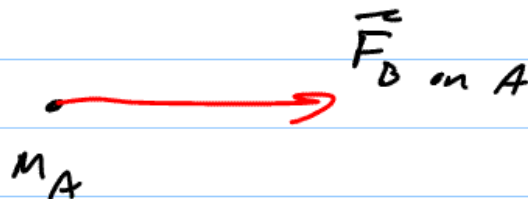
Written Homework Problem 3: "In one trial
 $v = 50.0 \text{ cm/sec.}$ "

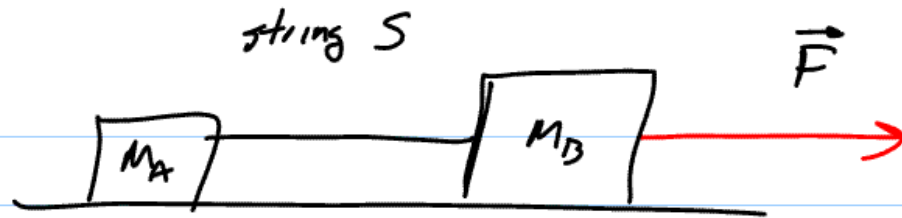
Corrected on Friday October 6.



$$F_{\text{net}} = F - F_{A \text{ on } B} = m_B a \Rightarrow$$

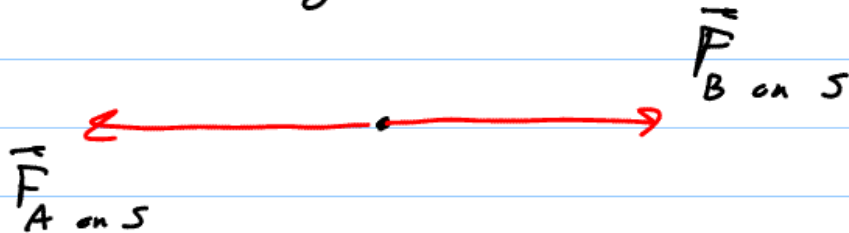
$$F_{A \text{ on } B} = m_A \frac{F}{m_A + m_B}$$



Example

$$M_S = 0$$

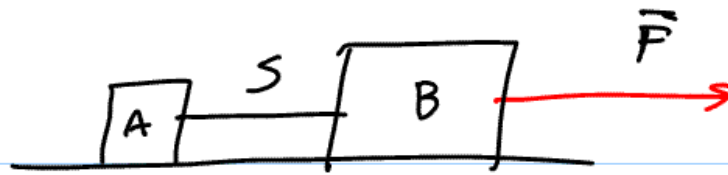
$$a = \frac{F}{M_A + M_B}$$

System: String

$$F_{\text{net}} = F_{B \text{ on } S} - F_{A \text{ on } S}$$

$$= \underline{M_S a} = 0$$

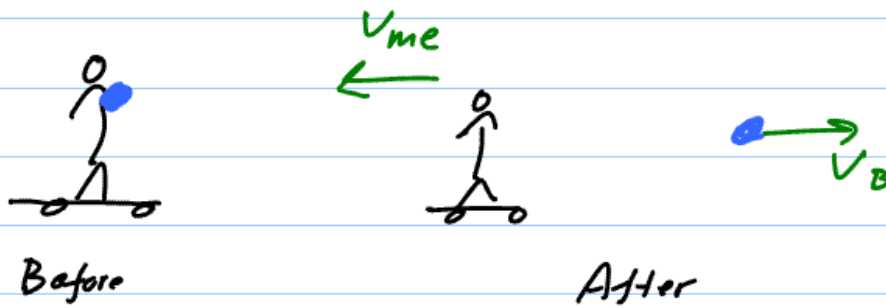
$$M_S = 0 \Rightarrow \vec{F}_{A \text{ on } S} = -\vec{F}_{B \text{ on } S}$$

Example

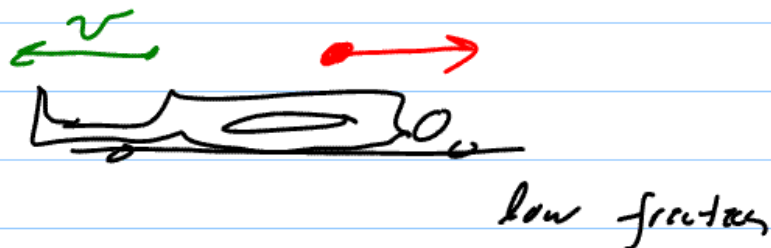
$$M_S \neq 0$$

$$M_{tot} = M_A + M_S + M_B$$

$$a = \frac{F}{M_{tot}}$$

Application

Heart! major action

Ballistocardiogram

CHAPTER 9

IMPULSE & MOMENTUM

§9.1 momentum $\vec{p} \equiv m\vec{v}$ "inertia"

$$\vec{F} = m\vec{a} = m \frac{d\vec{v}}{dt} = \frac{d(m\vec{v})}{dt}$$

if $m = \text{constant}$

$$\vec{F} = \frac{d\vec{p}}{dt}$$

$$\vec{p} = m\vec{v}$$

more complete

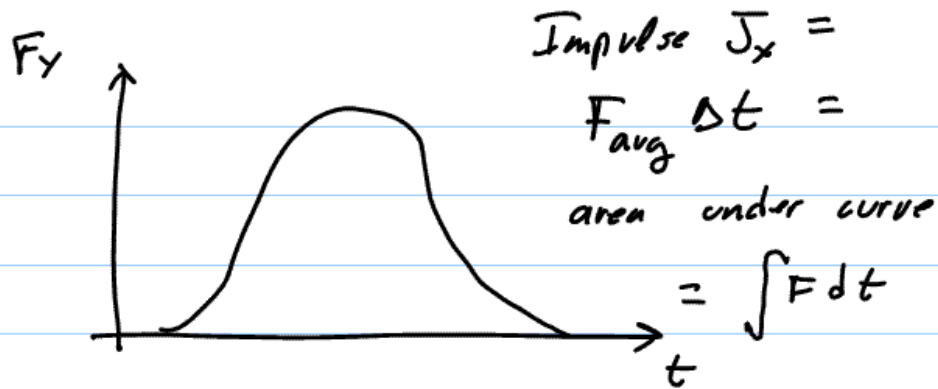
MAT135 next week (§3.2)
product rule

$$\frac{d(xy)}{dz} = x \frac{dy}{dz} + y \frac{dx}{dz}$$

$$\vec{F} = m \frac{d\vec{v}}{dt} + \vec{v} \frac{dm}{dt}$$

correct!

$$d\vec{p} = \vec{F} dt$$



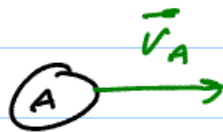
$$J_{\text{tot}, x} = \Delta p_x = p_{f, x} - p_{i, x}$$

$$\vec{J} = 0 \Rightarrow \Delta \vec{p} = 0$$

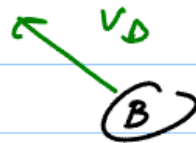
\vec{p} conserved.

§9.2 - NTA

§9.3



Collide



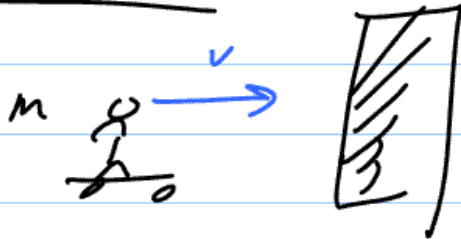
$$\vec{F}_{A \text{ on } B} = - \vec{F}_{B \text{ on } A}$$

$$\vec{J}_{A \text{ on } B} = - \vec{J}_{B \text{ on } A}$$

$$\vec{\Delta p}_B = - \vec{\Delta p}_A$$

All collisions! \vec{p}_{tot} conserved

Applications



$$\Delta p = mv = J_{\text{tot by wall}}$$

$$\vec{J} = F_{\text{avg}} \Delta t$$

Damage to people in collisions!

$$\Delta t \lesssim 100 \text{ ms}$$

$$\text{damage} \sim J_{\text{tot}}$$

$\Delta t > 100 \text{ ms}$

Damage $\propto a \propto \frac{F}{m}$