HW: Collision (Due 11 pm central time, 12/9, Tuesday).
HW hints are posted on course web (http://web.njit.edu/~kenahn)
Minimum C grade required to fullfill pre-requisute condition

Final Exam: December 16th, Tuesday

Time : 8:30-11 am (arrive by 8:15am)

Room: KUPF 106 (different from common exams)

Bring scientific calculator & **photo ID**

Covers everything learned in this semester

Formula, sample problem, sample problem solution on web.
Old exams are posted on web.

"Impulse" and "Momentum"

Last class…

Motion of system of particles

(Motion of center of mass)

Today…

Motion of system of particles under gravity

Elastic collision in 1D

Review for final exam

More explanation on the motion of center of mass under gravity force

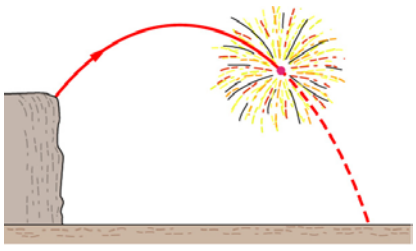
Newton's second law for C.O.M.: $\vec{F}_{net,ext} = M\vec{a}_{com}$

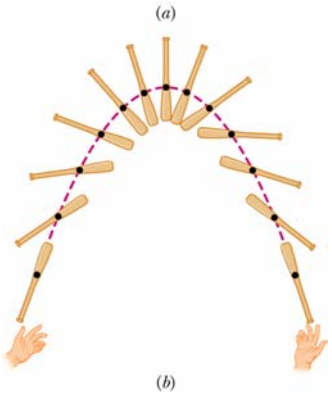
Under gravity,

$$\vec{F}_{net,ext} = -m_1 g\mathbf{j} - m_2 g\mathbf{j} - \ldots$$
$$= -(m_1 + m_2 + \ldots)g\mathbf{j} = -Mg\mathbf{j}$$

$$\therefore -Mg\mathbf{j} = M\vec{a}_{com}$$

$$\therefore \vec{a}_{com} = -g\mathbf{j}$$ → Usual projectile motion

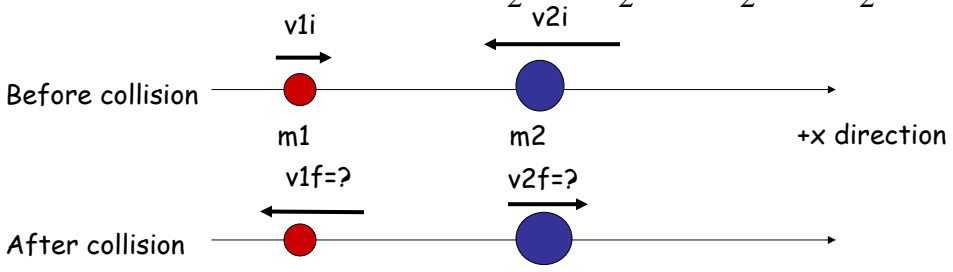




Elastic Collisions in One Dimension

Both total momentum & **total kinetic energy** are conserved.

$$m_1 v_{1,i} + m_2 v_{2,i} = m_1 v_{1,f} + m_2 v_{2,f} \quad \& \quad \frac{1}{2} m_1 v_{1i}^2 + \frac{1}{2} m_2 v_{2i}^2 = \frac{1}{2} m_1 v_{1f}^2 + \frac{1}{2} m_2 v_{2f}^2$$



$$v_{1,f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1,i} + \frac{2m_2}{m_1 + m_2} v_{2,i} \quad \text{and} \quad v_{2,f} = \frac{2m_1}{m_1 + m_2} v_{1,i} + \frac{m_2 - m_1}{m_1 + m_2} v_{2,i}$$

(see text for proof)

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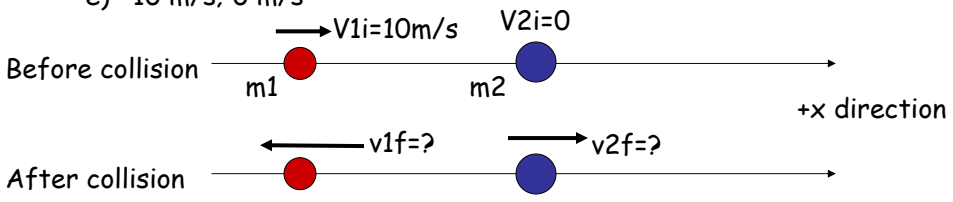
iClicker Quiz

In 1D elastic collision, if m1=m2, vi1=+10 m/s, v2i=0, then, after collision v1f= _____ and v2f= _____.

a) 5 m/s; 5 m/s
b) -5 m/s; 5 m/s
c) 0 m/s; 10 m/s
d) 0 m/s; -10 m/s
e) -10 m/s; 0 m/s



$$v_{1,f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1,i} + \frac{2m_2}{m_1 + m_2} v_{2,i} \quad \text{and} \quad v_{2,f} = \frac{2m_1}{m_1 + m_2} v_{1,i} + \frac{m_2 - m_1}{m_1 + m_2} v_{2,i}$$

Preparing for final exam:

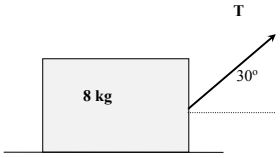
Solve old final exams posted on web !!

Solve sample problems posted on web !!

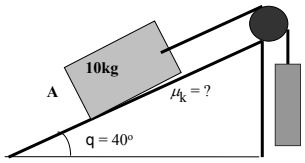
Solve three common exam problems.

Review today: 5-6 examples

A 8-kg block is pulled along a rough horizontal surface ($\mu k = 0.2$) by a rope that exerts an 30 N tension force directed 30 degree above the horizontal. What is the magnitude of the friction force on the block?



Two blocks are connected over a pulley as shown in the figure. The mass of the block A is 10 kg and the mass of the hanging block B is 8 kg. The block A ***slides up the*** 40 **degree*-incline at a constant speed***. There is a friction force between the incline and the block A.



B, 8kg

(a) Find the tension in the string .
(b) Find the normal force that the incline exerts on block A.

A vertical spring stretches 8 cm when a 1.6 kg block is hung from its end.

(a) What is the spring constant of the spring?

(b) What is the Elastic Potential Energy of the spring?

An athlete of mass 70 kg on a trampoline leaps straight up into the air with an initial speed of 9.0 m/s. Find the kinetic energy of the athlete when she is halfway up to her maximum height.

iClicker Quiz

A 0.2-kg rubber ball is dropped from the window of a building. It strikes the sidewalk below
at 30m/s and rebounds up at 20m/s. The impulse on the ball during the collision is:

A. 10N · s upward
B. 10N · s downward
C. 2.0N · s upward
D. 2.0N · s downward
E. 9.8N · s upward

A bullet of mass 10 g strikes a ballistic pendulum of mass 2.0 kg. The center of mass of the pendulum rises a vertical distance of 12 cm. Assuming that the bullet remains embedded in the pendulum, calculate the bullet's initial speed.