

CH3 MOTION & FORCE Pt. 2

EQ.s of motion.

$$1) v_f = v_i + at \quad 3) v_f^2 - v_i^2 = 2as$$
$$2) S = v_i t + \frac{1}{2} at^2$$

$$\bullet \vec{a} \leftrightarrow \vec{g}$$

* Note: Only valid if $\Delta a = 0$

NEWTON'S LAWS OF MOTION.

→ PRINCIPIA of Mathematics.

→ Applicable to objects moving w/ $v \ll c$.

1st LAW: "A body will stay in a fixed state unless it is acted upon by a force."

• The inability of a body to change its state is termed as 'Inertia'.

2nd LAW: "The effect of applied force causes the object to change its velocity in the direction of the force."

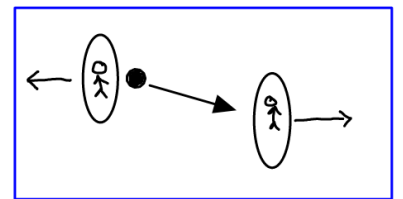
$$F = m \left(\frac{dv}{dt} \right) \rightarrow a = ma.$$

3rd LAW: "If object A exerts force on object B, then object B will also exert equal but in opposite direction a force on object A."

SYMMETRY: Forces occurs in pairs.

Exchange particles.

$$(Action) F_{AB} = -F_{BA} (Reaction)$$



INERTIAL FRAME.

→ Body is at rest or uniform relative velocity.

$$\vec{a} = 0$$

NON INERTIAL FRAME.

→ Not moving with uniform rel. velocity

$$\vec{a} \neq 0.$$

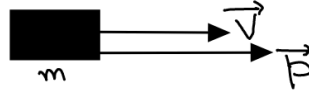
FUN FACTS:

- Earth is approx inertial b/c negligible angular accel.
- Zero force environment \Rightarrow inertial.

MOMENTUM

Linear Momentum

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



Impulse.

$$\vec{I} = \Delta\vec{P} = \vec{F}\Delta t.$$

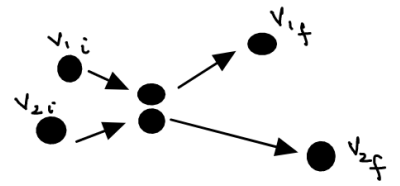
$$[\vec{I}] = [\vec{P}]$$

Law of Conservation of Momentum

Isolated
Sys :

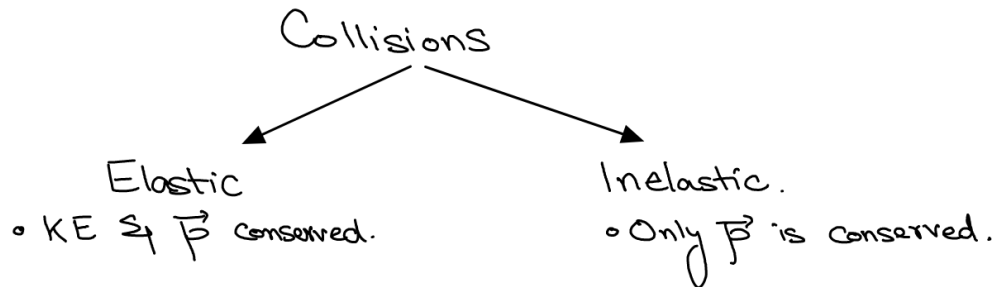
$$\sum P_{\text{initial}} = \sum P_{\text{final}}.$$

$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}.$$



Collisions

→ Interaction b/w bodies.

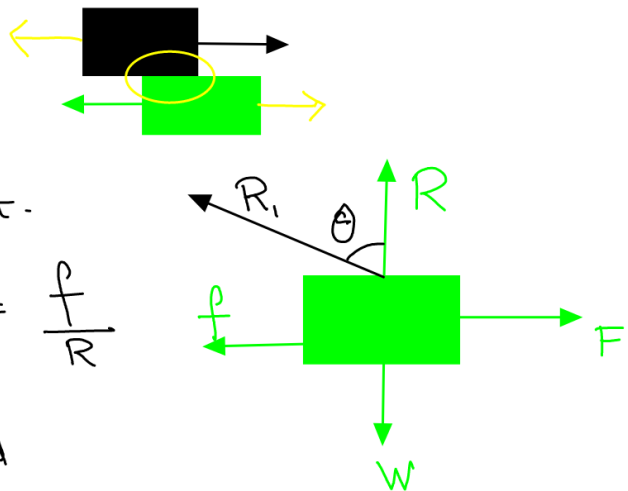


FRICITION.

- Resisting force.
- Acts opposite to motion.
- Indep. of area of contact.

$$\mu (\text{coeff of friction}) = \frac{f}{R}$$

- Nature of material
- Surface
- Temp.



Static friction:

→ Contact before motion

$$f_s = \mu_s R.$$

Kinetic friction:

→ During motion

$$f_k = \mu_k R.$$

Angle of friction (θ)

From fig. above:

$$\tan \theta = \frac{f}{R} = \mu$$