Nishant Jindal

Law of Motion

Chapter's to be Covered :- [For New Students]

⇒

→ Basic Mathematics.

[Differentiation / Integration] (Definite)

$\left[\frac{d}{dx}(x^n) = nx^{n-1}\right]$ ✓

$\left[\int x^n dx = \frac{x^{n+1}}{n+}\right]$

⇒ graph :- [① Linear function ② quadratic function]

⇒ 3 Kinematics Equations.

⇒ Maxima Minimima.

⇒ Vector ⇒ [Parallelogram Law of vector addition]

⇒ [Component of vector.

⊛ Relative velocity

[1st lecture]

Concept of physics

→ [H.C. Verma]

1st part

→ D.P.P.

→ PYQ Chapterwise (Jee Mains)

Self Pratice

⇒ Inclass :-

① Irodov

② Jee Advance PYQ's

③ My Illustrations

④ Sheet (Doubt)

(Jee Advance) Pratice

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↳ Newton's 1st Law :→

↳ Also Called Law of "Inertia" or Law of Equilibrium :→

Inertia :- [Tendency of a body to Continue its present state]

A ← Rest

⇒ Present State ⇒ [To Continue its Rest position]

⇒ [To Continue its uniform Velocity Motion] ⇒ present State

B

[Block A and block B Changes their present State if there is net resultant force.

If $[\vec{F}_{net}] = 0$. the body Continue its present state and we can say body is in equilibrium

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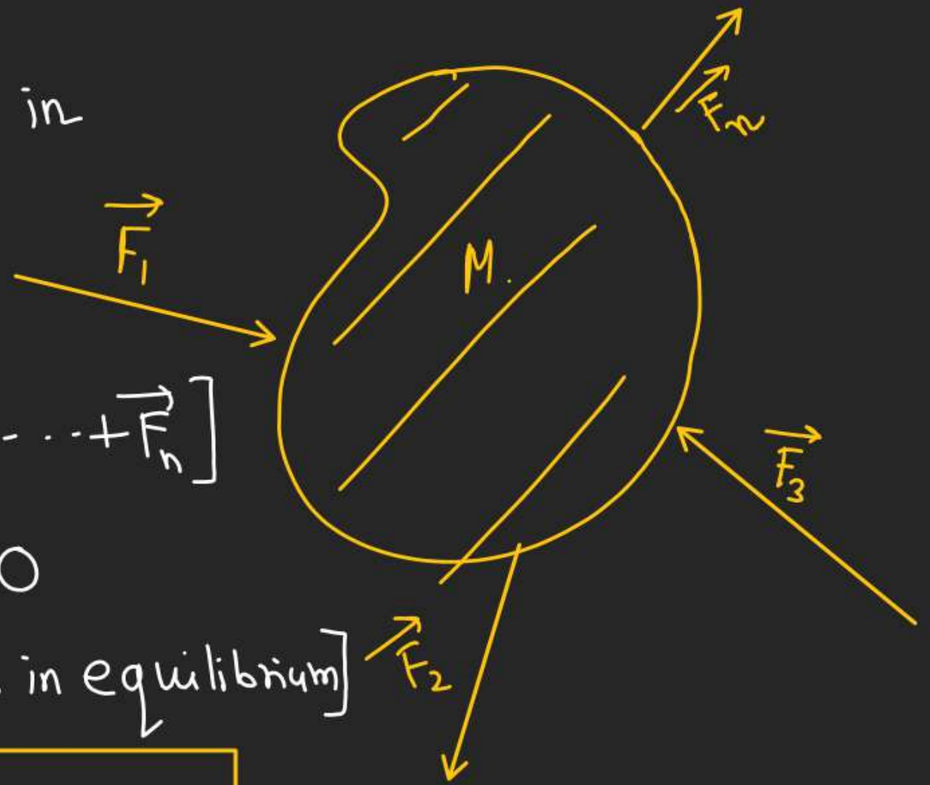
4. Newton's 1st Law

For body to be in equilibrium



$$\vec{F}_{net} = [\vec{F}_1 + \vec{F}_2 - \cdots + \vec{F}_n]$$

if $\vec{F}_{net} = 0$

[Body is in equilibrium]

$$\sum_{i=1}^{n} \vec{F}_i = 0$$

$\Rightarrow$ Newton's 1st Law

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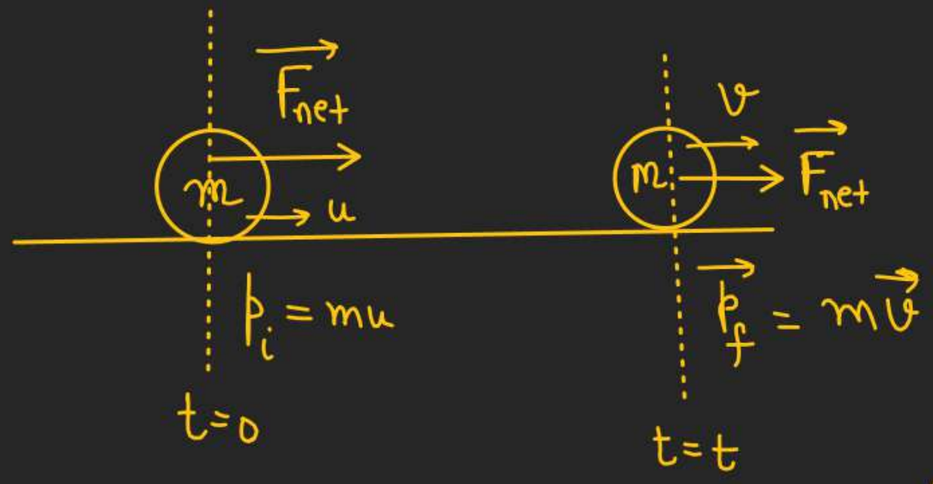
w.r.t ⇒ [with respect to]

(4) Newton's 2nd Law

↳ Net external force acting on a body is equal to rate of change of linear momentum of the body w.r.t time. $\left[\vec{F} = \frac{d\vec{p}}{dt}\right]$

Linear momentum $\left[\vec{p} = m\vec{v}\right]$



$\vec{F}_{net} = \left(\frac{\Delta\vec{p}}{\Delta t}\right)$ ⇑ [Avg force]

$(\vec{F}_{net})_{inst} = \lim_{\Delta t \to 0}\left(\frac{\Delta\vec{p}}{\Delta t}\right) = \frac{d\vec{p}}{dt}$

$(\vec{F}_{net})_{inst} = \frac{d}{dt}(m\vec{v}) = m\frac{d\vec{v}}{dt} + \vec{v}\left(\frac{dm}{dt}\right)$

if m = Constant

$(\vec{F}_{net}) = m\left(\frac{d\vec{v}}{dt}\right)$

$\vec{F}_{net} = m\vec{A}$

⇑ Newton's 2nd Law

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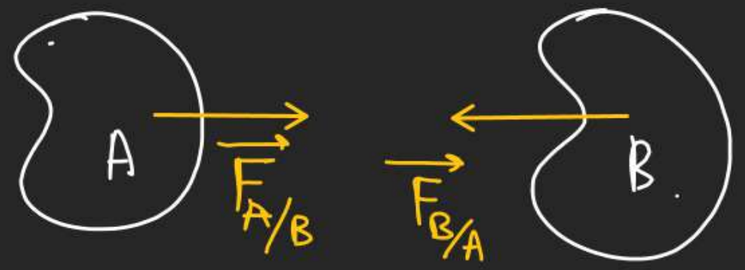
(A) Newton's 3rd Law :→

↳ (For every action there is equal and opposite reaction)



If $[\vec{F}_{A/B} = -\vec{F}_{B/A}] \Rightarrow$ These two forces are action & reaction pair. if

- They are equal & opposite
- Acts along the same line of action
- Forces must be of same nature.

Ex:- [Gravitational force]

According to Law of Gravitation

$$|\vec{F}_{m_1/m_2}| = |\vec{F}_{m_2/m_1}| = \left[\frac{Gm_1m_2}{r^2}\right]$$

Follow Newton's 3rd Law

Note:-1 [Forces which follow Newton's 3rd Law always occur in pair so for the whole system these forces will not contribute towards the net external force]

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F.B.D :→

[Free body diagram]

↳ In F.B.D we draw all the forces acting on the body due to another body Or due to Surrounding

↳ Choose a refrance axis and take the Component of all the forces along the Choosen refrance axis.

↳ Apply Newton's 1st Law where body is in equlibrium & apply Newton's 2nd Law where body is in acclerated motion.

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44. Some Commonly occuring forces in Mechanics :→

[G = (Universal gravitional Constant)]

① Gravitational force due to earth :-

- It always acts Vertically downward
- It always acts at the center of gravity.

$$F_{m/Me} = \frac{G m M_e}{R_e^2} = \left(\frac{G M_e}{R_e^2}\right) m$$

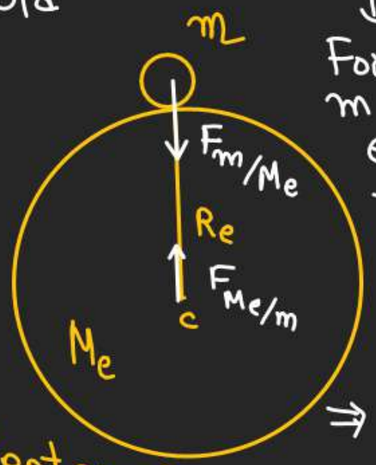
$F_{m/Me}$ ⇓ Force on m due to earth at the surface

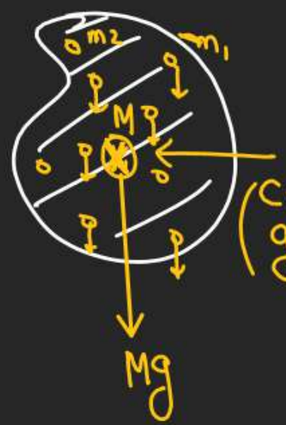
$$F_{m/Me} = mg$$

(Weight of the body)

[$g = 9.8\ m/s^2$]

⇓ Accleration due to gravity





(center of gravity)

Note

⇒ If 'g' is uniform then center of mass and center of gravity are same.