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Gravitation

Hand Notes For JEE Mains, Advance, NEET UG, Class 11 & 12 etc...

Hand Notes

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Gravitation



$F_g \propto m_1 m_2$, $F_g \propto \frac{1}{r^2}$ $\Rightarrow$ $F_g = \frac{m_1 m_2}{r^2}$

$F_g = G\frac{m_1 m_2}{r^2}(-\hat{r})$

$\vec{r} = \frac{\vec{r}}{|\vec{r}|}$

$F_g = G\frac{m_1 m_2}{r^3}(-\vec{r})$

$\vec{F}_{12} = \frac{Gm_1 m_2}{r^3}(\vec{r}_{12})$

$\vec{F}_{21} = \frac{Gm_1 m_2}{r^3}(\vec{r}_{21}) = \frac{Gm_1 m_2}{r^3}(-\vec{r}_{12})$

$\vec{F}_{12} = -\vec{r}_{21}$

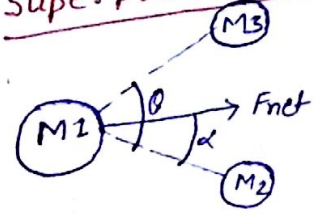
$\vec{F}_{21} = -\vec{F}_{12}$

$\vec{F}_{21} + \vec{F}_{12} = 0$

* G = universal Gravitational const.
  $= 6.67 \times 10^{-11}\ Nm^2/kg^2$ (S.I)
  $= 6.67 \times 10^{-8}$ (c.g.s) **
  Dimension $\Rightarrow$ $M^{-1}L^3T^{-2}$ (ALL PMT)

NOTE →
* It is only attractive nature force & its direction is always towards mass.
* It is ***** Medium Independent force. (AIR)
* Gravitational force on a particle inside spherical shell is zero. Hower (unlike a metallic shell which shields electric forces & magnetic forces) the shell does not shield other bodies outside it from external gravitational forces on particle inside. Gravitational shielding is not possible!! (AIR, AIIMS 2015)
* Gravitational force field is conservative force field. Work done is independent from path. (AIR)
* In Absence of Gravitational force field net force on system is zero thats Why linear Momentum conserved. (AIR)
* Line of Action of Gravitational force is passed from fixed point & It obey Inverse square law thats Why it is called central force. (AIR)
* Gravitational force b/W two mass remain unchange With Absence of another mass. (!!)

Superposition of force →



In

$F_{net} = F_1^2 + F_2^2 + 2F_1F_2\cos\theta$

$\alpha = \tan^{-1}\left(\frac{F\sin\theta}{F_1 + F_2\cos\theta}\right)$

* Net Gravitational force is vector Addition of Indivisual force.

$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2 + \cdots + \vec{F}_N = \sum_{i=1}^{i=N} \vec{F}_i$

NOTE →
* In a Regular polygon If similar mass is placed at the vertex net force at central mass zero.
* If (n−1) similar mass placed at the vertex of Regular polygon net force on central mass equal to F.