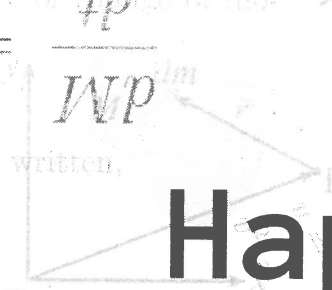


$$0 = \frac{dL}{dt}$$



Happy

Retirement!

$$\vec{L}_{\text{net}} = \sum \vec{L}_i = \sum \vec{r}_i \times \vec{p}_i = \sum \sin \theta_i \vec{r}_i \times \vec{v}_i$$

here L_A is the angular momentum of a rigid body rotating about an axis, A , at angular speed ω . \vec{r}_i is the displacement between an origin, O , and m_i .

$$L_A = I \omega$$

$$\frac{\partial \vec{B}}{\partial t} + \nabla \times \vec{B} = \vec{J}$$

$$\sum \vec{F} = \frac{d\vec{p}}{dt} = m\vec{a}$$

$$\sum F = ma = m\ddot{x} = m\dot{v} = m \frac{dv}{dx} v = \frac{m}{2} \frac{dv^2}{dx}$$

7. Kinetic energy: for pure rectilinear motion,

equality for constant m . For 1-D rectilinear motion, this can be written, $\frac{\partial \vec{s}}{\partial t} = \vec{v}$. Consider a perturbation to a circular orbit. Then, $\frac{d^2 r}{dt^2} + f(r) = 0$. Perturbations are stable if $f'(r) < 0$, unstable if $f'(r) > 0$, and indeterminate if $f'(r) = 0$.

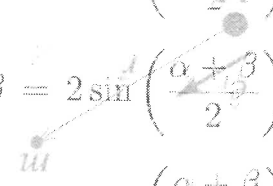
1. Adding and subtracting sines and cosines:

$$\cos \alpha + \cos \beta = 2 \cos \left(\frac{\beta + \alpha}{2} \right) \cos \left(\frac{\beta - \alpha}{2} \right)$$

$$\cos \alpha - \cos \beta = 2 \sin \left(\frac{\beta + \alpha}{2} \right) \sin \left(\frac{\beta - \alpha}{2} \right)$$

$$\sin \alpha + \sin \beta = 2 \sin \left(\frac{\alpha + \beta}{2} \right) \cos \left(\frac{\alpha - \beta}{2} \right)$$

$$\sin \alpha - \sin \beta = 2 \cos \left(\frac{\alpha + \beta}{2} \right) \sin \left(\frac{\alpha - \beta}{2} \right)$$



$$\frac{d\vec{S}}{dt} = \sum \vec{F}_{\text{ext}}$$

Newton's Law of Gravitation: $G = 6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2$. The force is attractive.

For a rigid body undergoing both translational and rotational motion to a circular orbit, the angular speed ω is the angular speed about A , and \vec{v} is a unit vector parallel to A . The orbital energy equation is $K_{\text{rot}} = \frac{1}{2} I \omega^2$. The solution is $r = r_0 e^{-\lambda t}$ for stable, $r = r_0 e^{\lambda t}$ for unstable, and $r = r_0$ for indeterminate.