Circular Motion

Rotational Kinematics

$\theta = \theta_0 + \omega_0 t + \alpha t^2/2$

$\omega = \omega_0 + \alpha t$

$\omega^2 = {\omega_0}^2 + 2\alpha(\theta - \theta_0)$

Relating rotational and linear quantities

Here R is the radius and s is arc length

$s = R\theta$

$v_t = R\omega$

$a_t = R\alpha$

$a = \sqrt{a_r^2 + a_\theta^2}$

$a_c = v^2/r$ (centripetal accel)

$L = I\omega$ (ang mom)

$2\pi rad = 1rev$

Newton's Second Law

$\Sigma\vec{F} = m\vec{a}$

$\Sigma\vec{F} = mv^2/r$

Work

Conservative (path independent) is spring, gravity, and normal. U is potential, K is kinetic

$W = \vec{F} \cdot \vec{s}$

$W = Fs\cos\theta$

$W_{tot} = \Delta k$

$W_{tot} = W_c + W_{nc}$

$W_c = -\Delta U$

$W_{nc} = \Delta K + \Delta U$ ## Energy $ME = KE + PE$

$W_{nc} = \Delta ME$

if $W_{nc} = 0$ then $\Delta ME = 0$ (conservation of mechanical energy)

Potential Energy

$U_{gravity} = mgy$

$U_{spring} = kx^2/2$

Kinetic Energy

$K = mv^2/2$

$Joule = Newton \cdot meter$