Linear Kinematics

$v_f = v_i + at$ $\qquad \Delta x = \frac{1}{2}(v_i + v_f)t$

$v_f^2 = v_i^2 + 2a\Delta x$ $\qquad \Delta x = v_i t + \frac{1}{2}at^2$

Rotational Kinematics

$\omega = \omega_i + \alpha t$ $\qquad \theta = \frac{1}{2}(\omega_f - \omega_i)t$

$\omega^2 = \omega_i^2 + 2\alpha\theta$ $\qquad \theta = \omega_i t + \frac{1}{2}\alpha t^2$

Potential Energy

$U_{gravity} = mgh$ $\qquad U_{spring} = \frac{1}{2}kx^2$

Kinetic Energy

$K = \frac{1}{2}mv^2$ $\qquad K_{rotational} = \frac{1}{2}I\omega^2$

$K_{rolling} = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$

Conservation of Energy

$\Delta K + \Delta U = 0$

Projectile Motion

$v_x = v\cos\theta$ $\qquad$ max height $h = \dfrac{v_y^2}{2g}$

$v_y = v\sin\theta$ $\qquad$ max range $r = \dfrac{v_x^2\sin(2\theta)}{g}$

$\theta = \tan^{-1}\dfrac{v_y}{v_x}$ $\qquad$ distance $d = \frac{1}{2}a_x t^2$

$t = \dfrac{2v_y}{g}$

Circular Motion

$F = m\frac{v^2}{r} = m\omega^2 r$ $\qquad f = \frac{rev}{sec}$

$\omega = 2\pi f = \frac{v}{r}$ $\qquad 1\frac{rev}{sec} = 2\pi\frac{rad}{sec}$

$\alpha = \frac{v^2}{r} = \frac{a}{r}$

Force

Newton's Second Law $\qquad \sum F = ma$

Hooke's Law $\qquad F_{spring} = -kx$

$F_{normal} = mgcos\theta$ $\qquad F_{friction} = \mu_k F_N$

$F_{centripetal} = \dfrac{mv^2}{r} = m\omega^2$

Work and Power

$E_i = PE_i + KE_i$ $\qquad E_f = PE_f + KE_f$

$W = \Delta E = E_f - E_i$ $\qquad W = FDcos\theta$

$W_{rotational} = \tau\theta$ $\qquad P = \dfrac{W}{t}$

Work and Power

$$E_i = PE_i + KE_i \qquad E_f = PE_f + KE_f$$

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