Visit https://rb.gy/mugq69 for a video break-down of these formulas.

nerd-notes.com

2024 Physics 1 Base Formula Sheet Done Right (Compact)

Equations	Notes
Rotational Motion	
$\Delta x \approx \Delta\theta \quad v \approx \omega \quad a \approx \alpha$	Approximate linear to rotational variable swaps
$\Delta x = r \times \Delta\theta \quad v = r \times \omega \quad a = r \times \alpha$	Exact linear to rotational conversions
$I = mr^2$	Rotational Inertia (point mass)
Kinematics	
$\Delta x = vt$	Distance, for when $a = 0$
$v_{avg} = \frac{\Delta x}{t}$	Average velocity (displacement/time)
$s_{avg} = \frac{d}{t}$	Average speed (distance/time)
$\Delta x = \frac{1}{2}t(v_f + v_0)$	Linear kinematic formula, for when $a = 0$
$v_f{}^2 = v_0{}^2 + 2a\Delta x$	Linear kinematic formula, missing t
$v_f = v_0 + at$	Linear kinematic formula, missing Δx
$\Delta x = v_0 t + \frac{1}{2}at^2$	Linear kinematic formula, missing v_f
$\Delta x = v_f t - \frac{1}{2}at^2$	Linear kinematic formula, missing v_0
$\omega_f{}^2 = \omega_0{}^2 + 2\alpha\Delta\theta$	Rotational Kinematic formula, missing t
$\omega_f = \omega_0 + \alpha t$	Rotational Kinematic formula, missing $\Delta\theta$
$\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2$	Rotational Kinematic formula, missing ω_f
Dynamics	
$F_{net} = ma$	A net force causes linear acceleration
$F_{net} = ma_c$	A net force, into an arc, causes centripetal acceleration
$\tau_{net} = I\alpha = F_\perp r = Frsin(\theta)$	A net torque causes angular acceleration
$a_c = \frac{v^2}{r}$	Centripetal acceleration
$F_s = -kx$	Spring force
$F_f = \mu_k N$	Kinetic frictional force
$0 \le F_s \le \mu_s N$	Static frictional force

Equations	Notes
$F_g = mg$	Gravitational force (near surface of a planet)
$F_g = G\frac{m_1 m_2}{r^2}$	Gravitational force
Momentum	
$p = mv$	Linear momentum
$\Delta p = F\Delta t = m\Delta v$	Change in linear momentum (linear impulse)
$L = I\omega = mrv$	Angular momentum
$\Delta L = \tau\Delta t = I\Delta\omega$	Change in angular momentum (angular impulse)
Energy	
$KE_T = \frac{1}{2}mv^2$	Translational kinetic energy
$KE_R = \frac{1}{2}I\omega^2$	Rotational kinetic energy
$PE_g = mgh$	Gravitational potential energy
$U_g = \frac{Gm_1m_2}{r}$	Gravitational potential energy
$EL = U_s = \frac{1}{2}kx^2$	Spring potential energy aka elastic energy
$W = F_{\parallel}d = Fdcos(\theta) = \Delta E$	Work energy
$E_i = E_f$	Conservation of energy
$P = \frac{W}{t} = \frac{E}{t}$	Power is energy per unit time
Simple Harmonic Motion	
$T = \frac{1}{f}$	Period is inverse of frequency
$\omega = \frac{2\pi}{T} = 2\pi f$	Angular velocity
$T = 2\pi\sqrt{\frac{L}{g}}$	Period of a oscillating pendulum
$T = 2\pi\sqrt{\frac{m}{k}}$	Period of a oscillating spring