AP Physics C Mechanics Formula Sheet

$\overline{V} = \frac{\Delta x}{\Delta t}$, $\quad v = \frac{dx}{dt}$

$\Delta x = v_0 t + \frac{1}{2}at^2$, $\quad \Delta x = v_f t - \frac{1}{2}at^2$

$\overline{a} = \frac{\Delta v}{\Delta t}$, $\quad a = \frac{dv}{dt}$

$v_f^2 = v_0^2 + 2a\Delta x$

$\Delta x = \frac{1}{2}\left(v_0 + v_f\right)t$

$F = ma$, $\quad w = mg$

$F_f = \mu F_N$ (μ_s is a maximum therefore can be less than calculated, and μ_k is constant)

$W = Fd\cos\theta$, $\quad W = \int Fdx\cos\theta$

$W = \Delta K$, $\quad W = -\Delta U$

$K = \frac{1}{2}mv^2$

$U_g = mgh$, $\quad U_g = -G\frac{m_1 m_2}{r}$

$U_i + K_i + W_{nc} = U_f + K_f$

$F_s = -kx$

$U_s = \frac{1}{2}kx^2$

$P = \frac{W}{t}$, $\quad P = Fv$

$p = mv$, $\quad p_i = p_f$, $\quad F = \frac{dp}{dt}$

$J = \Delta mv$, $\quad J = Ft$, $\quad J = \int Fdt$

$$F_g = G\frac{m_1 m_2}{r^2}$$

$$F_c = \sum F_r, \quad F_c = ma_c, \quad F_c = m\frac{v^2}{r}, \quad F_c = m\omega^2 r$$

$$s = r\theta$$

$$v = r\omega$$

$$a_t = r\alpha$$

$$\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2$$

$$\overline{\omega} = \frac{\Delta\theta}{\Delta t}, \quad \omega = \frac{d\theta}{dt}$$

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$$\Delta\theta = \frac{1}{2}\left(\omega_i + \omega_f\right)t$$

$$I = \sum mr^2, \quad I = \int r^2 dm, \quad I = \int r^2 \rho dV$$

$$I_p = I_{cm} + Md^2$$

$$K_r = \frac{1}{2}I\omega^2$$

$\tau = I\alpha, \quad \tau = rF\sin\theta$ (RHR for direction)

$$L = I\omega, \quad L = mvr_\perp, \quad L = mvr\sin\theta$$

$T^2 = k_s a^3, \quad k_s = \dfrac{4\pi^2}{Gm_s},$ (k goes to 1 when AU's and Years are used)

$$T_p = 2\pi\sqrt{\frac{l}{g}}$$

$$T_s = 2\pi\sqrt{\frac{m}{k}}$$

$$T_{cp} = 2\pi\sqrt{\frac{I}{mgd}}$$

$$\omega = \frac{2\pi}{T}$$

$$x = A\cos(\omega t + \phi)$$

$$v = -A\omega\sin(\omega t + \phi)$$

$$a = -A\omega^2\cos(\omega t + \phi), \quad a = \frac{d^2x}{dt^2}, \quad a = -\omega^2 x$$