You may detach this formula sheet from the test. It does not need to be handed in.

University Physics I and IA: Equation Sheet for Final Exam

Equations

$$\vec{v} = \frac{d\vec{x}}{dt}$$

$$\vec{a} = \frac{d\vec{v}}{dt}$$

$$v_x = v_{ox} + a_x t$$

$$x = x_o + v_{ox} t + \frac{1}{2} a_x t^2$$

$$v_x{}^2 = v_{ox}^2 + 2a_x\left(x - x_o\right)$$

$$x = x_o + \frac{1}{2}\left(v_{ox} + v_x\right)t$$

$$a_{centripetal} = \frac{v^2}{r} \qquad \sum \vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}$$

$$f_k = \mu_k \left|\vec{n}\right| \qquad f_s \le \mu_s \left|\vec{n}\right|$$

Math

$$\vec{A} \cdot \vec{B} = \left|\vec{A}\right|\left|\vec{B}\right|\cos(\theta) = A_x B_x + A_y B_y + A_z B_z$$

$$\int x^m dx = \frac{x^{m+1}}{m+1} + C \qquad (m \ne -1)$$

$$\frac{dx^m}{dx} = mx^{m-1}$$

If $ax^2 + bx + c = 0$

Then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

$$= (A_y B_z - A_z B_y)\hat{i} + (A_z B_x - A_x B_z)\hat{j} + (A_x B_y - A_y B_x)\hat{k}$$

$$\left|\vec{A} \times \vec{B}\right| = \left|\vec{A}\right|\left|\vec{B}\right|\sin\theta$$

$$W = \int \vec{F} \cdot d\vec{r} = \int F dr \cos(\theta) = \int F_x dx + \int F_y dy + \int F_z dz \qquad K = \frac{1}{2}mv^2 \qquad W_{net} = K_f - K_i$$

$$F_x = -\frac{dU}{dx} \qquad U_{spring} = \frac{1}{2}kx^2 \qquad U_{grav} = mgh \qquad \mathrm{P} = \frac{dW}{dt} = \vec{F} \cdot \vec{v}$$

$$E_{mech,f} = E_{mech,i} + W_{non-cons} \qquad E_{mech} = U_{grav} + U_{spring} + K \qquad K_i + U_{gi} + U_{el.i} = K_f + U_{gf} + U_{el,f} + \Delta U_{\text{int}}$$

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$\vec{p} = m\vec{v}$ $\quad \vec{J} = \int \vec{F}dt = \vec{F}_{av}\Delta t = \Delta\vec{p}$ $\quad I = \sum_i m_i r_i^2 = \int r^2 dm$ $\quad I = I_{cm} + Md^2$

$\vec{\omega} = \frac{d\vec{\theta}}{dt}$ $\quad \vec{\alpha} = \frac{d\vec{\omega}}{dt}$ $\quad \vec{\tau} = \vec{r}\times\vec{F}$ $\quad \vec{l} = \vec{r}\times\vec{p}$ $\quad L_z = I\omega_z$

$\omega = \omega_o + \alpha t$ $\quad s = r\theta$ $\quad \sum\vec{\tau} = I\vec{\alpha} = \frac{d\vec{L}}{dt}$ $\quad \vec{r}_{cm} = \frac{\sum m_i\vec{r}_i}{\sum m_i} = \frac{\int \vec{r}dm}{M}$

$\theta = \theta_o + \omega_o t + \frac{1}{2}\alpha t^2$ $\quad v_t = r\omega$ $\quad W = \int_{\theta_1}^{\theta_2} \vec{\tau}\cdot d\vec{\theta}$ $\quad \mathrm{P} = \vec{\tau}\cdot\vec{\omega}$

$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_o)$ $\quad a_t = r\alpha$ $\quad K_{rot} = \frac{1}{2}I\omega^2$ $\quad K_{tot} = \frac{1}{2}mv_{axis}^2 + \frac{1}{2}I\omega_{axis}^2$

$\theta = \theta_o + \frac{1}{2}(\omega_o + \omega)t$ $\quad a_{centripetal} = r\omega^2$

$x(t) = A\cos(\omega t + \phi)$ $\quad \omega = \frac{2\pi}{T} = 2\pi f$ $\quad \frac{d^2x}{dt^2} = -\omega^2 x$ $\quad T = 2\pi\sqrt{\frac{m}{k}}$ $\quad T = 2\pi\sqrt{\frac{I}{mgd}}$

$\frac{\partial^2 y(x,t)}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 y(x,t)}{\partial t^2}$ $\quad y(x,t) = A\cos(kx \pm \omega t + \phi)$ $\quad k = \frac{2\pi}{\lambda}$ $\quad v = \lambda f = \frac{\omega}{k}$

$v = \sqrt{\frac{F_T}{\mu}}$ $\quad v = \sqrt{\frac{B}{\rho}}$ $\quad I = \frac{P}{4\pi r^2}$ $\quad y_{sw}(x,t) = A_{sw}\sin(kx)\sin(\omega t)$

$\beta = (10dB)Log_{10}\left(\frac{I}{I_0}\right)$ $\quad I_0 = 10^{-12} W/m^2$ $\quad f_L = f_S\left(\frac{v \pm v_L}{v \pm v_S}\right)$ $\quad f_{beat} = |f_1 - f_2|$

$|\vec{F}_{grav}| = G\frac{m_1 m_2}{r^2}$ $\quad U_{grav} = -G\frac{m_1 m_2}{r}$ $\quad G = 6.674\times10^{-11} N\cdot m^2/kg^2$ $\quad g = 9.80 m/s^2$

Speed of Sound = 343 m/s