Physics I - Final Exam
Equations

$R^2 = X^2 + Y^2$ $\qquad$ $\theta = \tan^{-1}(\frac{Y}{X})$

$\vec{v} = \frac{d\vec{r}}{dt}$ $\qquad$ $\vec{a} = \frac{d\vec{v}}{dt}$ $\qquad$ $\vec{p} = m\vec{v}$

for constant a:

$v = v_0 + at$ $\qquad$ $x = x_0 + v_0 t + \frac{1}{2}at^2$

$v^2 = v_0^2 + 2a(x - x_0)$ $\qquad$ $\bar{v} = \frac{1}{2}(v_0 + v)$

$\sum \vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}$ $\qquad$ $\vec{F}_{ab} = -\vec{F}_{ba}$ $\qquad$ $\vec{F}_g = G\frac{m_1 m_2}{r^2}\hat{r}_{12}$

$F_{fr} = \mu_s F_N$ or $\mu_k F_N$ $\qquad$ $\vec{F}_s = -k\vec{x}$ $\qquad$ $a_R = \frac{v^2}{R}$

$W = \int \vec{F} \cdot d\vec{l}$ $\qquad$ $K.E. = \frac{1}{2}mv^2$

potential energies:

$U_g(h) = mgh$ $\qquad$ $U_s(x) = \frac{1}{2}kx^2$ $\qquad$ $U_G(r) = -G\frac{m_1 m_2}{r}$

$U(r) = -\int \vec{F}(r) \cdot d\vec{r}$ $\qquad$ $P = \frac{dE}{dt} = \vec{F} \cdot \vec{v}$ $\qquad$ $\vec{J} = \Delta\vec{p} = \int \vec{F} dt$

$\vec{\omega} = \frac{d\vec{\theta}}{dt}$ $\qquad$ $\vec{\alpha} = \frac{d\vec{\omega}}{dt}$ $\qquad$ $\vec{L} = \vec{R} \times \vec{p} = Rmv\sin\theta = I\vec{\omega}$

$v = R\omega$ $\qquad$ $a = R\alpha$

for constant α:

$\omega = \omega_0 + \alpha t$ $\qquad$ $\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$

$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$ $\qquad$ $\bar{\omega} = \frac{1}{2}(\omega_0 + \omega)$

$\vec{\tau} = \vec{R} \times \vec{F} = RF\sin\theta$ $\qquad$ $\sum \vec{\tau} = I\alpha = \frac{dL}{dt}$ $\qquad$ $K.E. = \frac{1}{2}I\omega^2$

$\rho = \frac{M}{V}$ $\qquad$ $P = \frac{F}{A}$ $\qquad$ $F_b = \rho g V_d$ $\qquad$ $P + \frac{1}{2}\rho v^2 + \rho gh = const$

for SHM:

$x(t) = A\cos(\omega t + \phi)$ $\qquad$ $\omega = \sqrt{\frac{k}{m}}$ or $\sqrt{\frac{g}{L}}$ $\qquad$ $v_{max} = \omega A$ $\qquad$ $a_{max} = \omega^2 A$

$\Delta L = \alpha L_0 \Delta T$ $\qquad$ $PV = Nk_B T = nRT$ $\qquad$ $\Delta E_{int} = Q - W$

$Q = mc\Delta T$ $\qquad$ $\mathrm{Q = m\,L}$ $\qquad$ $\Delta S = \frac{Q}{T}$