The following equations will be given on the second exam in this form. All of your solutions for the problems should start from these equations.

EQUATIONS

$\mathbf{v}_{av} = \Delta\mathbf{r} / \Delta t$

$\mathbf{v} = d\mathbf{r} / dt$

$\mathbf{a}_{av} = \Delta\mathbf{v} / \Delta t$

$\mathbf{a} = d\mathbf{v} / dt$

$v^2 = v_o^2 + 2a\Delta x$

$\Delta x = v_o t + 1/2at^2$

$v = v_o + at$

$\Delta x = 1/2(v_o + v)t$

$a = v^2 / R$

$v = 2\pi r / T$

$x = -b \pm \text{sq.rt.}(b^2 - 4ac) / 2a$

$\mathbf{F_{NET}} = m\mathbf{a}$

$W = F_g = mg$

$D = 1/2\ C\rho A v^2$

$F = Gm_1m_2 / r^2$

$\mathbf{F}_1 = \int d\mathbf{F}$

$f_{s,max} = \mu_s F_N$

$f_k = \mu_k F_N$

$K = 1/2\ mv^2$

$W = Fd\cos\phi = \mathbf{F}\cdot\mathbf{d}$

$W = \Delta K$

$F_x = -kx$

$W_s = 1/2kx_i^2 - 1/2kx_f^2$

$W = {}_{x1}\int^{x2} F(x)dx$

$P_{avg} = W / \Delta t$

$P = dW / dt$

$W = {}_{ri}\int^{rf} F\cos\phi dr = {}_{ri}\int^{rf} \mathbf{F}\cdot\mathbf{dr}$

$U(y) = mgy$

$U(x) = 1/2kx^2$

$F(x) = - dU(x) / dx$

$W = \Delta E = \Delta E_{mec} + \Delta E_{th} + \Delta E_{int}$

$\Delta E_{th} = f_k\ d$

$U = -GMm / r$

$\mathbf{r}_{com} = 1/M\ \Sigma m_i \mathbf{r}_i$

$x_{com} = \int x\ dm$

$\mathbf{p} = m\ \mathbf{v}$

$\mathbf{J} = \Delta\mathbf{p}$

$\mathbf{J} = {}_{ti}\int^{tf} \mathbf{F}(t)dt$

$\mathbf{J} = \mathbf{F}_{avg}\Delta t$

$s = r\theta$

$\omega_{av} = \Delta\theta / \Delta t$

$\omega = d\theta / dt$

$\alpha_{av} = \Delta\omega / \Delta t$

$\alpha = d\omega / dt$

$\omega = \omega_o + \alpha t$

$\Delta\theta = \omega_o t + 1/2\ \alpha t^2$

$\omega^2 = \omega_o^2 + 2\alpha\Delta\theta$

$\Delta\theta = 1/2(\omega_o + \omega)t$

$v = r\omega$

$a_t = r\alpha$

$I = \Sigma m_i r_i^2$

$K = 1/2\ I\ \omega^2$

$I = \int r^2 dm$

$I = I_{cm} + Mh^2$

$\tau = Fr_\perp = Fr\sin\phi$

$\tau_{net} = I\alpha$

$W = {}_{\theta i}\int^{\theta f} \tau d\theta$

$\boldsymbol{\tau} = \mathbf{r} \times \mathbf{F}$

$\mathbf{l} = \mathbf{r} \times \mathbf{p}$

$\boldsymbol{\tau}_{net} = d\mathbf{l} / dt$

$L = I\omega$

$\Omega = Mgr / I\omega$

$\rho = M/V$

$P = F / A$

$P = P_o + \rho gh$

$\rho_1 A_1 v_1 = \rho_2 A_2 v_2$

$T = T_C + 273.15$

$p_1 + \rho g y_1 + 1/2\rho v_1^2 = p_2 + \rho g y_2 + 1/2\rho v_2^2$

$\Delta L = \alpha\ L\ \Delta T$

$T = 9/5T + 32$

$Q = mc\Delta T$

o F c

$\Delta V = \beta V_o \Delta T$

$\Delta E_{int} = Q - W$

$N = nN_A$

$PV = nRT$

$v_{rms} = sq.rt.(3RT/M)$

$Q = nC\Delta T$

$T = 1/f$

$\omega = 2\pi f$

$T = 2\pi$ sq. root (L / g)

$W = {}_{Vi}\int^{Vf} PdV$

$P_{cond} = Q/t = kA(T_H - T_C) / L$

$M_{sam} = nM$

$PV = NkT$

$\lambda = V / (sq.rt.(2)\pi d^2 N)$

$\Delta S = {}_i\int^f dQ / T$

$K = |Q_L| / |W|$

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

$v = f\lambda$

$Q = mL$

$Prad = \sigma \varepsilon A T^4$

$M = mN_A$

$K_{AV} = 3/2\ kT$

$E_{int} = 3/2\ nRT$

$e = |W| / |Q_H|$

$e_C = 1 - T_L / T_H$

$T = 2\pi$ sq.rt. (m / k)

CONSTANTS

$g = 9.8\ m/s^2$	$G = 6.67 \times 10^{-11}\ Nm^2/kg^2$	$\rho_{water} = 1000\ kg/m^3$
$1\ atm = 1.013 \times 10^5 Pa$	$R = 8.31\ J/mol \cdot K$	$k = 1.38 \times 10^{-23}\ J/K$