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

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

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

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

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

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

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

$v = v_o + at$

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

$a = v^2 / R$

$v = 2\pi r / T$

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

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

$W = F_g = mg$

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

$F = Gm_1m_2 / r^2$

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

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

$f_k = \mu_k F_N$

$K = 1/2\ mv^2$

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

$W = \Delta K$

$F_x = -kx$

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

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

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

$P = dW / dt$

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

$U(y) = mgy$

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

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

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

$U = -GMm / r$

## CONSTANTS

$g = 9.8\ m/s^2$ $\quad$ $G = 6.67 \times 10^{-11}\ Nm^2/kg^2$