Number ___ ___ - ___ ___ ___ ___

**Physics 2205** 13 December, 1999
**Useful Equations and Constants**

$s = \theta\, r$

$v = \Delta x/\Delta t$ $\omega = \Delta\theta/\Delta t$ $v = \omega\, r$

$a = \Delta v/\Delta t$ $\alpha = \Delta\omega/\Delta t$ $a_t = \alpha\, r$ $a_r = v^2/r = \omega^2 r$

$x = (\frac{1}{2})\, at^2 + v_o t + x_o$ $\theta = (\frac{1}{2})\, \alpha t^2 + \omega_o t + \theta_o$

$v = at + v_o$ $\omega = \alpha t + \omega_o$

$v^2 = v_o^2 + 2a(x - x_o)$ $\omega^2 = \omega_o^2 + 2\alpha(\theta - \theta_o)$

$\Sigma \boldsymbol{F} = m\boldsymbol{a}$ $F_g = m\, g$ $F_e = -\, k\, x$ $F_{fr} = \mu\, F_N$

$K = \frac{1}{2}\, m\, v^2$ $U_g = m\, g\, h$ $U_e = \frac{1}{2}\, k\, x^2$ $W = F\, d \cos\theta$

$F_g = G\, m_1\, m_2 / r^2$ $T^2 = (4\pi^2/GM)\, r^3$

$\boldsymbol{p} = m\, \boldsymbol{v}$ $\Sigma \boldsymbol{F} = \Delta \boldsymbol{p}/\Delta t$ $v_{1i} - v_{2i} = v_{2f} - v_{1f}$

$P = W/t$ $x_{cm} = \Sigma\, (m_i\, r_i) / \Sigma\, m_i$

$\tau = r\, F \sin\theta$ $\Sigma\, \tau = I\, \alpha$

$\rho = m/V$ $\Delta P = \rho\, g\, h$ $F_b = \rho_{fl}\, V_d\, g$

$P = F/A$ $P_{in} = P_{out}$ $A_1 v_1 = A_2 v_2 = \Delta V/\Delta t$

$f = 1/T$ $T = 2\,\pi\,(m/k)^{1/2}$ $T = 2\,\pi\,(L/g)^{1/2}$

$\omega = 2\,\pi\, f$ $\Delta\lambda/\lambda = v_{source}/v_{wave}$ $f_{beat} = \Delta f$

$v = \lambda\, f$ $\lambda_n = 2L/n$ $f_n = vn/(2L) = n\, f_1$

$I \propto 1/r^2$ $A \propto 1/r$ $P = I/A$

$\theta_i = \theta_r$ $n = c/v$ $n_1 \sin\theta_1 = n_2 \sin\theta_2$

$f = r/2$ $1/f = 1/d_o + 1/d_i$ $m = (h_i/h_o) = -\,(d_i/d_o)$

$d \sin\theta = m\lambda$ $D \sin\theta = m\lambda$ $\sin\theta_c = n_2/n_1$

$I = I_o/2$ or $I = I_o \cos^2\theta$ $\tan\theta_p = n_2/n_1$

f-ratio $= f/D$ $\theta_{res} = 1.22\, \lambda\, /\, D$

$g = 9.8$ m/s$^2$ $c = 3.00 \times 10^8$ m/s 1 nm $= 10^{-9}$ m

$G = 6.67 \times 10^{-11}$ N m$^2$/kg$^2$ $v_{sound} = 343$ m/s 1 μm $= 10^{-6}$ m

| | ρ (kg/m$^3$) | $n$ |
|---|---|---|
| air | 1.29 | 1.00 |
| water | 1000 | 1.33 |
| helium | 0.179 | |