Physics 121

Trig
$\sin \theta = o/h$
$\cos \theta = a/h$
$\tan \theta = o/a$
distance $= 2\pi r$ (circle)
area $= \pi r^2$ (circle)

Kinematics
$v = \Delta x/\Delta t$
$a = \Delta v/\Delta t$
$\Delta x = v_o t + \frac{1}{2} a t^2$
$v_f^2 = v_o^2 + 2a\Delta x$
$g = 9.8\ m/s^2$

Dynamics
$F_{net} = ma$
$F_g = Gm_1m_2/r^2$
$F_g = mg$ (near surface of earth)
$f_k = \mu_k F_N$
$f_s \leq \mu_s F_N$
$a_c = v^2/r = \omega^2 r$

Work and Energy
$W = Fd \cos \theta$
$KE = \frac{1}{2} m v^2$
$W_{net} = \Delta KE$
$W_{nc} = \Delta KE + \Delta PE$
$PE = mgh$

Impulse and Momentum
Impulse $= F t = \Delta p$
$p = mv$

$m_1v_1 + m_2v_2 = (m_1+m_2)v_f$ (Inelastic)
$V_{cm} = \Sigma m_i v_i/\Sigma m_i$

Elastic Collisions
1) Find V_{cm}
2) Subtract V_{cm} from each velocity
3) Change sign of each velocity
4) Add V_{cm} to each velocity

Rotations
Rolling without slipping
$x = \theta r$
$v = \omega r$
$a = \alpha r$

$X_{cm} = \Sigma m_i x_i/\Sigma m_i$
$\Delta\theta = \omega_o t + \frac{1}{2} \alpha t^2$
$\omega_f^2 = \omega_o^2 + 2\alpha\Delta\theta$
$\omega = \Delta\theta/\Delta t$
$\alpha = \Delta\omega/\Delta t$
$KE = 1/2 I\omega^2$
$\tau_{net} = I \alpha$
$\tau = f(\Delta x) \sin\theta$
$I = mr^2$
$l = I\omega$ (Angular momentum)

Springs
$F = -k\Delta x$
$PE = \frac{1}{2} k \Delta x^2$

Constants
$G = 6.67 \times 10^{-11}$
$M_{earth} = 5.98 \times 10^{24}$
$R_{earth} = 6.38 \times 10^6$