$$g = 9.8\ \mathrm{m/s^2} \qquad G = 6.67 \times 10^{-11}\ \mathrm{N{\cdot}m^2/kg^2}$$

$$\vec{\mathbf{v}}(t) = \frac{d}{dt}\vec{\mathbf{r}}(t) \qquad \vec{\mathbf{a}}(t) = \frac{d}{dt}\vec{\mathbf{v}}(t) \qquad |a_r| = \frac{v^2}{r} \qquad \Sigma\vec{\mathbf{F}} = m\vec{\mathbf{a}} \qquad \vec{\mathbf{F}}_{12} = -\vec{\mathbf{F}}_{21}$$

$$\Sigma W = \Delta K \qquad \Delta U_{sys} = -W_C \qquad W_{NC} = \Delta E_{sys}$$

$$\int_{t_i}^{t_f} \Sigma\vec{\mathbf{F}}dt = \Delta\vec{\mathbf{p}} \qquad \Sigma\vec{\mathbf{F}}_{ext} = M_{sys}\vec{\mathbf{a}}_{cm} \qquad I_o = I_{cm} + M_{sys}R^2_{o\to cm}$$

$$\Sigma\tau_{ext,o} = I_o\alpha \qquad \Sigma\tau_{ext,cm} = I_{cm}\alpha \qquad K_{sys} = K_{rot,cm} + K_{trans,cm}$$

$$\Sigma\vec{\tau}_{ext,O} = \frac{d}{dt}\vec{\mathbf{L}}_{sys,O} \qquad \Sigma\vec{\tau}_{ext,cm} = \frac{d}{dt}\vec{\mathbf{L}}_{sys,cm} \qquad F_G = G\frac{m_1 m_2}{r^2}$$

DIFFERENTIAL EQUATIONS

$$x(t) = x_{max}cos(\omega t + \phi) \qquad \text{solves} \qquad \frac{\mathrm{d}^2}{\mathrm{dt}^2}\mathrm{x(t)} = -\mathrm{Cx(t)} \qquad \text{with} \qquad \omega = \sqrt{\mathrm{C}}$$