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

KINEMATICS: $\vec{\mathbf{v}}(t) \equiv \frac{d}{dt}\vec{\mathbf{r}}(t)$ $\quad$ $\vec{\mathbf{a}}(t) \equiv \frac{d}{dt}\vec{\mathbf{v}}(t)$ $\quad$ $|a_r| = \frac{v^2}{r}$ $\quad$ $\vec{\mathbf{v}}_{P/S} = \vec{\mathbf{v}}_{P/S'} + \vec{\mathbf{v}}_{S'/S}$

PARTICLES: $F_G = G\frac{m_1 m_2}{r^2}$ $\quad$ $\vec{\mathbf{F}}_{2on1} = -\vec{\mathbf{F}}_{1on2}$ $\quad$ $\Sigma\vec{\mathbf{F}} = m\vec{\mathbf{a}}$ $\quad$ $\int_{t_i}^{t_f} \Sigma\vec{\mathbf{F}}dt = \Delta\vec{\mathbf{p}}$

$\Sigma W = \Delta K$ $\quad$ $\Sigma\vec{\boldsymbol{\tau}}_{\mathrm{O}} = \frac{\mathrm{d}}{\mathrm{dt}}\vec{\mathbf{L}}_{\mathrm{O}}$

SYSTEMS: $\vec{\mathbf{r}}_{cm} \equiv (\Sigma_i m_i \vec{\mathbf{r}}_i)/M_{sys}$ $\quad$ $\Sigma\vec{\mathbf{F}}_{ext} = M_{sys}\vec{\mathbf{a}}_{cm}$ $\quad$ $\int_{t_i}^{t_f} \Sigma\vec{\mathbf{F}}_{ext}dt = \Delta\vec{\mathbf{p}}_{sys}$

$\Delta U_{sys} \equiv -W_C$ $\quad$ $W_{NC} = \Delta E_{sys}$ $\quad$ $\Sigma\vec{\boldsymbol{\tau}}_{ext,\mathrm{O}} = \frac{\mathrm{d}}{\mathrm{dt}}\vec{\mathbf{L}}_{sys,\mathrm{O}}$

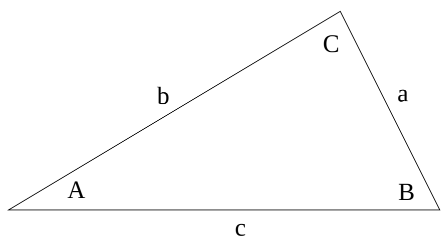
RIGID: $I_z \equiv \Sigma_i m_i r^2_{i\to z}$ $\quad$ $I_z = I_{cm} + M_{sys}R^2_{cm\to z}$ $\quad$ $K_{sys} = \frac{1}{2}I_{cm}\omega^2 + \frac{1}{2}M_{sys}v^2_{cm}$

$\Sigma\tau_{ext,z} = I_z\alpha_z$ $\quad$ $\vec{\mathbf{L}}_{sys,\mathrm{O}} = I_{cm}\vec{\boldsymbol{\omega}} + \vec{\mathbf{r}}_{\mathrm{O}\to cm} \times \vec{\mathbf{p}}_{sys}$

QUADRATIC FORMULA: The solutions of $ax^2 + bx + c = 0$ are

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

TRIGONOMETRY:



$$\frac{sin(A)}{a} = \frac{sin(B)}{b} = \frac{sin(C)}{c} \qquad c^2 = a^2 + b^2 - 2ab \cdot cos(C)$$

DIFFERENTIAL EQUATIONS

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

EXPANSIONS:

$$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \cdots$$

$$sin(\theta) = \theta - \frac{\theta^3}{3!} + \cdots$$

$$cos(\theta) = 1 - \frac{\theta^2}{2!} + \cdots$$