Formulas and Constants

$$g = 9.81 \text{ m/s}^2 \quad , \quad G = 6.67 \times 10^{-11} \text{ N m}^2\text{/kg}^2$$
$$R_{\text{Earth}} = 6.38 \times 10^6 \text{ m} \quad , \quad M_{\text{Earth}} = 5.98 \times 10^{24} \text{ kg}$$
$$M_{\text{Sun}} = 1.99 \times 10^{30} \text{ kg} \quad , \quad d_{\text{Earth-Sun}} = 1.5 \times 10^{11} \text{ m}$$

$$\vec{A} + \vec{B} = \vec{C} \quad \Rightarrow \quad A_x + B_x = C_x \quad , \quad A_y + B_y = C_y$$

$$C_x = C\cos\theta \quad , \quad C_y = C\sin\theta \quad , \quad C = \sqrt{C_x^2 + C_y^2} \quad , \quad \theta = \arctan\left(\frac{C_y}{C_x}\right)$$

$$\Delta(\text{thing}) = \text{thing}_f - \text{thing}_i$$

$$\bar{v} = \frac{\Delta x}{\Delta t} \quad , \quad v = v_0 + at \quad , \quad \Delta x = v_0 t + \frac{1}{2}at^2 \quad , \quad v^2 = v_0^2 + 2a\Delta x$$

$$\vec{F}_{\text{net}} = m\vec{a} \quad , \quad F_{\text{grav}} = \frac{Gm_1m_2}{r^2} \quad , \quad f_k = \mu_k F_N \quad , \quad f_s \leq \mu_s F_N$$

$$\text{weight} = mg \quad , \quad \vec{F}_{\text{cent}} = m\vec{a}_{\text{cent}} \quad , \quad a_{\text{cent}} = \frac{v^2}{r} \quad , \quad v = \frac{2\pi r}{T}$$

$$W = F\Delta x\cos\theta \quad , \quad \text{KE} = \frac{1}{2}mv^2 \quad , \quad \text{PE} = mgh \quad , \quad \text{E} = \text{KE} + \text{PE}$$

$$\text{KE}_i + \text{PE}_i = \text{KE}_f + \text{PE}_f \quad , \quad \Delta\text{KE} + \Delta\text{PE} = 0 \quad , \quad W = \Delta\text{KE}$$

$$W_{\text{non-cons}} = \Delta E = E_f - E_i \quad , \quad \text{average power} = \frac{\Delta E}{\Delta t}$$

$$\vec{p} = m\vec{v} \quad , \quad \text{impulse} = \vec{I} = \Delta\vec{p} = m\Delta\vec{v} = \bar{\vec{F}}_{\text{ext}}\Delta t$$

$$\vec{p}_{1i} + \vec{p}_{2i} = \vec{p}_{1f} + \vec{p}_{2f} \quad , \quad \Delta\vec{p}_1 + \Delta\vec{p}_2 = 0$$