

Classical Mechanics

Translation
The motion of objects as a whole

Rotation
The spinning motion of objects

Kinematics <u>Laws:</u> none <u>Definitions:</u> Position \vec{r} Displacement $d\vec{r}$ Velocity $\vec{v} \equiv \frac{d\vec{r}}{dt}$ Acceleration $\vec{a} \equiv \frac{d\vec{v}}{dt}$ <u>Useful Relations:</u> Kinematic Equations $x = x_o + v_o t + \frac{1}{2} a t^2$ $v = v_o + at$ $v^2 = v_o^2 + 2a(x - x_o)$ $x - x_o = \frac{1}{2}(v + v_o)t$ Tangential Speed $v_t = \frac{2\pi r}{T}$ Centripetal Acceleration $a_c = \frac{v^2}{r}$	Force Momentum Energy Kinematics Torque Angular Momentum Energy

$$\text{Dot Product } \vec{A} \bullet \vec{B} \equiv AB \cos \theta = A_x B_x + A_y B_y + A_z B_z$$

$$\text{Cross Product } \vec{A} \times \vec{B} \equiv AB \sin \theta \hat{n}$$

$$\vec{A} \times \vec{B} = (A_y B_z - A_z B_y) \hat{i} + (A_z B_x - A_x B_z) \hat{j} + (A_x B_y - A_y B_x) \hat{k}$$

$$\text{Acceleration due to gravity } g = 9.80 \text{ m/s}^2$$

$$\text{Earth - mass: } 5.98 \times 10^{24} \text{ kg } \text{ radius: } 6.38 \times 10^6 \text{ m}$$

$$\text{Moon - mass: } 7.36 \times 10^{22} \text{ kg } \text{ radius: } 1.74 \times 10^6 \text{ m}$$

$$\text{Sun - mass: } 1.99 \times 10^{30} \text{ kg } \text{ radius: } 6.96 \times 10^8 \text{ m}$$

$$\text{Earth - moon distance: } 3.82 \times 10^8 \text{ m}$$

$$\text{Sun - Earth distance: } 1.50 \times 10^{11} \text{ m}$$