Laws, Principles, Useful Relationships, and Other Information

The Definition of Velocity: $\vec{v} \equiv \frac{d\vec{r}}{dt}$

The Definition of Acceleration: $\vec{a} \equiv \frac{d\vec{v}}{dt}$

The Kinematic Equations:

$v = v_o + at$

$x = x_o + v_o t + \frac{1}{2}at^2$

$v^2 = v_o^2 + 2a(x - x_o)$

$x - x_o = \frac{1}{2}(v + v_o)t$

Centripetal Acceleration: $a_c = \frac{v^2}{r}$

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

Cross Product $\vec{A} \times \vec{B} \equiv AB\sin\theta\hat{n} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$

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

Earth - mass: 5.98×10^{24} kg radius: 6.38×10^6 m

Moon - mass: 7.36×10^{22} kg radius: 1.74×10^6 m

Sun - mass: 1.99×10^{30} kg radius: 6.96×10^8 m

Earth - moon distance: 3.82×10^8 m

Sun - Earth distance: 1.50×10^{11} m