

Phys 101 Formula Sheet for Major Exam I (011)

$$y = c x^n \quad ; \quad dy/dx = cn x^{n-1}$$

Motion in One Dimension

$$v = \frac{dx}{dt} \quad ; \quad a = \frac{dv}{dt} \quad ; \quad \bar{v} = \frac{\Delta x}{\Delta t} \quad ; \quad \bar{a} = \frac{\Delta v}{\Delta t}$$

Motion with Constant Acceleration

$$x - x_0 = v_0 t + \frac{1}{2} a t^2 \quad ; \quad v^2 = v_0^2 + 2a(x - x_0)$$
$$v = v_0 + at \quad ; \quad \bar{v} = (v_0 + v)/2$$

Free Fall

$$a = -g \quad ; \quad g = 9.8 \text{ m/s}^2$$

Vectors

$$\vec{a} \cdot \vec{b} = ab \cos \theta, \quad |\vec{a} \times \vec{b}| = ab \sin \theta$$

Motion in Two Dimensions

$$\vec{v} = \frac{d\vec{r}}{dt} \quad ; \quad \vec{a} = \frac{d\vec{v}}{dt}$$

$$\vec{r} = \vec{r}_0 + \vec{v}_0 t + \frac{1}{2} \vec{a} t^2 \quad ; \quad \vec{v} = \vec{v}_0 + \vec{a} t$$

Projectile Motion

$$a_x = 0 \quad (x-x_0) = v_0 t \cos \theta_0$$
$$a_y = -g \quad (y-y_0) = v_0 t \sin \theta_0 - \frac{1}{2} g t^2$$
$$H = v_0^2 \sin^2 \theta_0 / 2g \quad R = v_0^2 \sin 2\theta_0 / g$$

Uniform Circular Motion

$$a = v^2/r$$

Relative Motion

$$\vec{V}_{PA} = \vec{V}_{PB} + \vec{V}_{BA}$$

$$\vec{V}_{AB} = \text{Velocity of A relative to B} = -\vec{V}_{BA}$$

Newton's Second Law

$$\sum \vec{F} = m\vec{a} \Leftrightarrow \sum F_x = ma_x \quad ; \quad \sum F_y = ma_y$$

Friction

$$f_{s,\max} = \mu_s N \quad ; \quad f_k = \mu_k N$$