

PHYS101 First Major Exam Formula Sheet

$$y = cx^n; \quad \frac{dy}{dx} = cnx^{n-1}$$

Motion in One Dimension

$$v = \frac{dx}{dt}; \quad a = \frac{dv}{dt}; \quad v_{\text{avg}} = \frac{\Delta x}{\Delta t}; \quad a_{\text{avg}} = \frac{\Delta v}{\Delta t}$$

Motion with Constant Acceleration

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

Free Fall

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

Vectors

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

Motion in Two Dimensions

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

$$r - r_0 = v_0 t + \frac{1}{2}\vec{a}t^2; \quad \vec{v} = \vec{v}_0 + \vec{a}t$$

Projectile Motion

$\vec{a}_x = 0$	$x - x_0 = v_0 \cos \theta_0 t$
$a_y = -g = -9.80 \text{ m/s}^2$	$y - y_0 = v_0 \sin \theta_0 t - \frac{1}{2}gt^2$
$H = v_0^2 \sin^2 \theta_0 / 2g$	$R = v_0^2 \sin 2\theta_0 / g$

Uniform Circular Motion

$$a = \frac{v^2}{r}$$

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

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

Friction

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