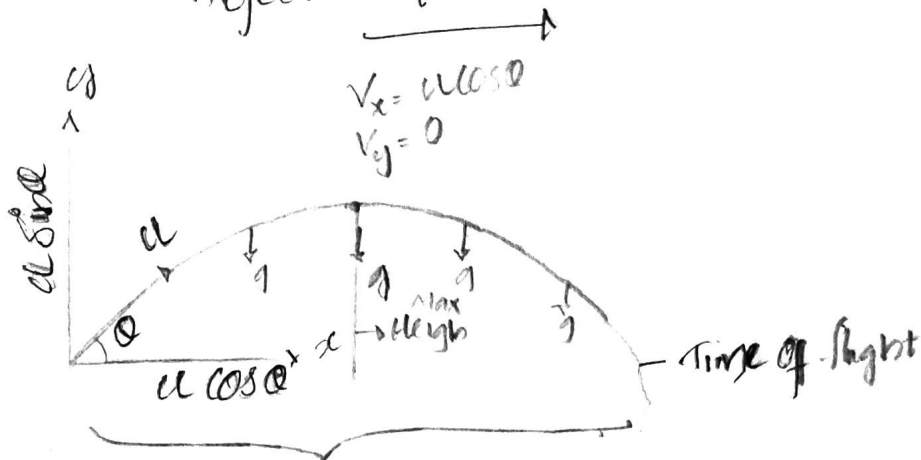


# Projectile Motion



Time Reached to Max height

$$v = u - gt \text{ [deceleration]}$$

$$t = \frac{u}{g}$$

$$t = \frac{u \sin \theta}{g}$$

Total time of flight

$$T = \frac{2u \sin \theta}{g}$$

Range  $\rightarrow$  Horizontal distance

$$R = v_x t$$

$$= \frac{u \cos \theta \times 2u \sin \theta}{g}$$

$$\frac{2 \sin \theta \cos \theta}{1} = \sin 2\theta$$

$$R = \frac{u^2 \sin 2\theta}{g}$$

Maximum Range

$$R_{\max} \rightarrow \sin 2\theta = 1 \text{ i.e. } \theta = 45^\circ$$

Expression for Maximum Height

$$v^2 = u^2 - 2as$$

$$H = \frac{u^2}{2a}$$

$$H = \frac{u^2 \sin^2 \theta}{2g}$$

Relation between x and y

$$x = u \cos \theta \cdot t$$

$$y = u \sin \theta \cdot t - \frac{1}{2} g t^2$$

$$= x \tan \theta - \frac{g}{2} \left( \frac{x}{u \cos \theta} \right)^2$$

$$\tan \alpha = \frac{y}{x}$$