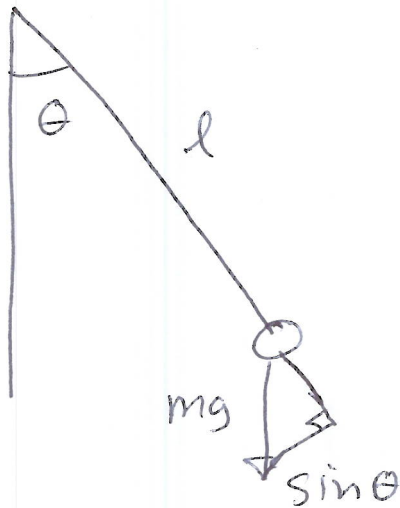


# Simple Pendulum



$$\begin{aligned} F &= ma = m \ddot{x} \\ -mg \sin \theta &= m \ddot{x} \\ -mg \sin \theta &= m l \ddot{\theta} \end{aligned}$$

$$\ddot{\theta} + \frac{g}{l} \sin \theta = 0$$

Approximate

$$\sin \theta \approx \theta - \frac{\theta^3}{3} + \dots$$

$$\ddot{\theta} + \frac{g}{l} \theta = 0$$

$$\ddot{\theta} + \omega^2 \theta = 0 \quad \Rightarrow \quad \omega^2 = \frac{g}{l}$$