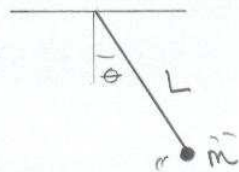
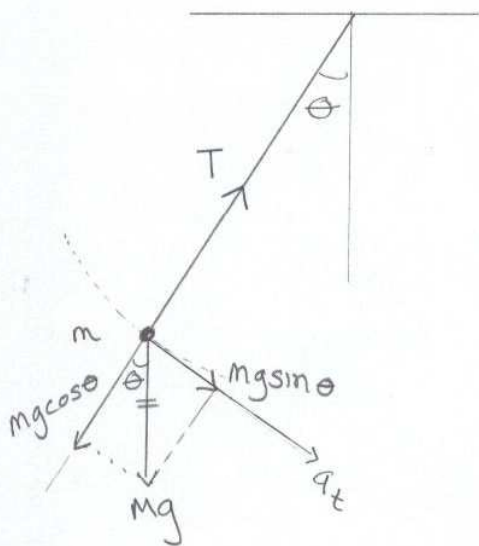


Simple Pendulum (a bob on a string)



14-7

If the bob is pulled back to an angle θ & let go, find the Period of oscillation. Is the motion Simple Harmonic?



$$\Sigma F_t = ma_t$$

$$F_t = -mg \sin \theta$$

$mg \sin \theta$ is a Restoring Force. This direction of this force is always opposite the displacement so as to bring the bob back toward equilibrium ($\theta = 0^\circ$)

$$-mg \sin \theta = ma_t, \text{ but } a_t = L\alpha \quad \& \quad \alpha = \frac{d^2\theta}{dt^2}$$

$$\text{so } a_t = -g \sin \theta$$

$$L\alpha = -g \sin \theta \Rightarrow L \frac{d^2\theta}{dt^2} = -g \sin \theta$$

$$\frac{d^2\theta}{dt^2} = -\frac{g}{L} \sin \theta \quad * \quad \frac{g}{L} \text{ has units of } (\text{rad/s})^2$$

$$\therefore \text{let } \frac{g}{L} = \omega^2$$

$$\text{so } \frac{d^2\theta}{dt^2} = -\omega^2 \sin \theta \quad \text{Is this the Form for SHM?} \rightarrow \begin{matrix} \text{O yes} \\ \text{O No} \end{matrix}$$