$$\vec{\tau} = \vec{r} \times \vec{F_g}$$

$$\vec{\tau} = \vec{L} \times (m\vec{g})$$

$$\vec{\tau} = mgL \sin(\theta)$$

$$\vec{\tau} = mgL \sin(\theta) \qquad \text{(into page)}$$

$$I = mL^2$$

$$\vec{\tau} = I\vec{\alpha}$$

$$\vec{\alpha} = \frac{\vec{\tau}}{I}$$

$$\vec{\alpha} = \left(\frac{g}{L}\right) \sin(\theta) \qquad \text{(into page)}$$

$$\vec{\alpha} = \left(\frac{g}{L}\right) \theta \qquad \text{(into page)}$$

$$\vec{\alpha} = -\left(\frac{g}{L}\right) \vec{\theta}$$

$$\frac{d^2\vec{\theta}}{dt^2} = -\left(\frac{g}{L}\right) \vec{\theta}$$

$$\frac{d^2\vec{x}}{dt^2} = -\left(\frac{k}{m}\right) \vec{x}$$

$$\theta(t) = A\cos(\omega t + \phi)$$

$$\omega = \sqrt{\frac{g}{L}}$$