

# University Physics 1A

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## Pendulum Lab

For a large physical pendulum:

$$-Lmg \sin \theta = I \frac{d^2 \theta}{dt^2}$$

For small angles  $\theta$  in radians, we can approximate this to:

$$\sin \theta \approx \theta$$

$$-Lmg\theta = I \frac{d^2 \theta}{dt^2}$$

We know that:

$$\begin{aligned}\theta &= A \cos(\omega t + \phi) \\ \frac{d\theta}{dt} &= -A\omega \sin(\omega t + \phi) \\ \frac{d^2\theta}{dt^2} &= -A\omega^2 \cos(\omega t + \phi) \\ &= -\omega^2 \theta \\ -Lmg\theta &= I(-\omega^2 \theta) \\ \omega &= \sqrt{\frac{Lmg}{I}}\end{aligned}$$

You can find all my notes at <http://omgimanerd.tech/notes>. If you have any questions, comments, or concerns, please contact me at [alvin@omgimanerd.tech](mailto:alvin@omgimanerd.tech)