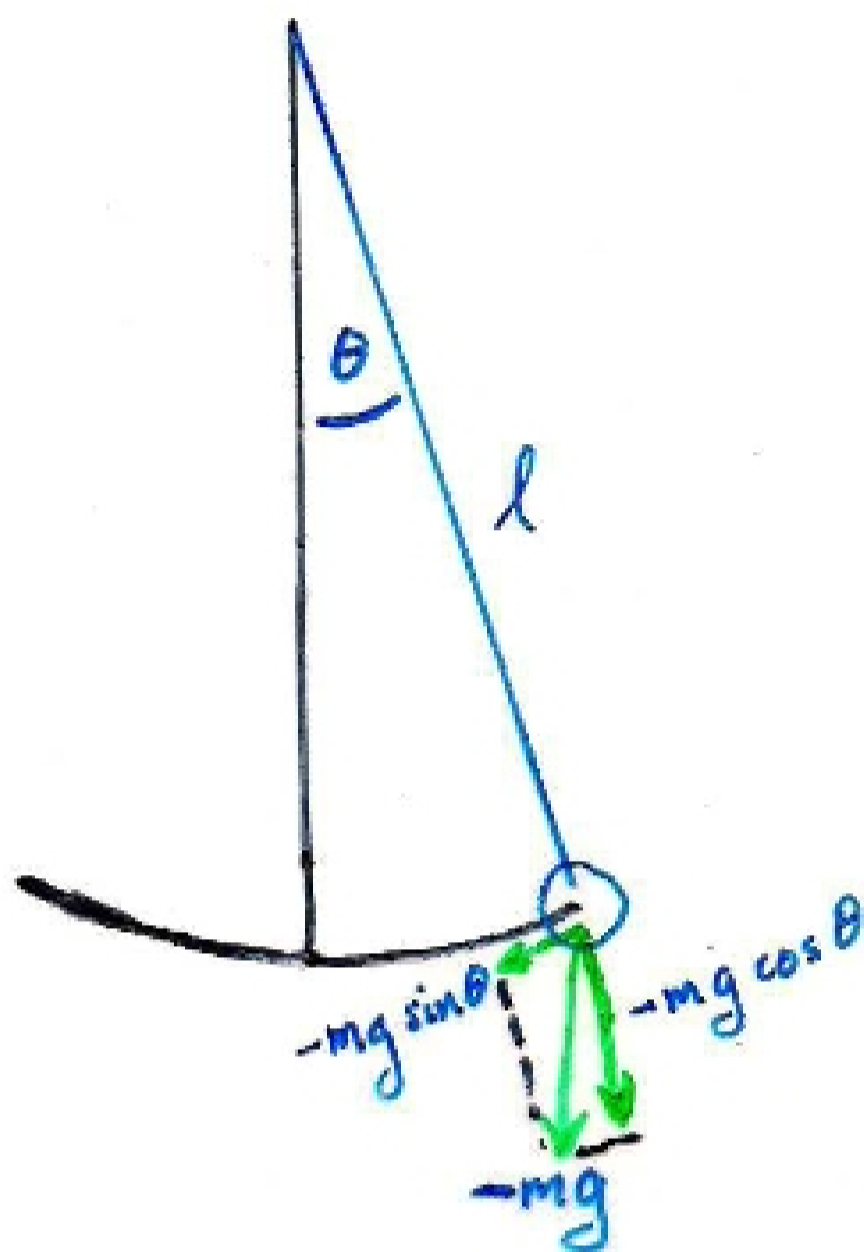


Simple Pendulum



$$-mg \sin \theta = F = ma = m \frac{d}{dt} v = m \frac{d}{dt} (l \dot{\theta}) = ml \ddot{\theta}$$

$$ml \ddot{\theta} + mg \sin \theta = 0$$

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

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

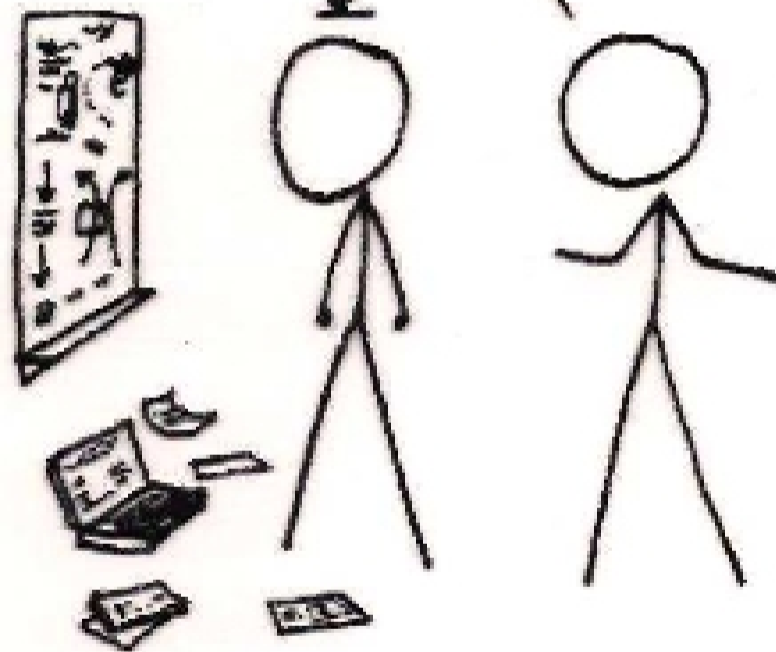
$$\omega_0 \equiv \sqrt{\frac{g}{l}}$$

General solution: $\theta(t) = A \cos(\omega_0 t) + B \sin(\omega_0 t)$

YOU'RE TRYING TO PREDICT THE BEHAVIOR
OF <COMPLICATED SYSTEM>? JUST MODEL
IT AS A <SIMPLE OBJECT>, AND THEN ADD
SOME SECONDARY TERMS TO ACCOUNT FOR
<COMPLICATIONS I JUST THOUGHT OF>.

EASY, RIGHT?

SO, WHY DOES <YOUR FIELD> NEED
A WHOLE JOURNAL, ANYWAY?



LIBERAL-ARTS MAJORS MAY BE ANNOYING SOMETIMES,
BUT THERE'S NOTHING MORE OBNOXIOUS THAN
A PHYSICIST FIRST ENCOUNTERING A NEW SUBJECT.

90% of physics is the simple harmonic oscillator.
the other half is the particle in a box.

Complications

Not-so-simple harmonic motion[?]

① Resistive force $f = -b\dot{x}$

For convenience, use $\beta \equiv \frac{b}{2m}$ so

$$f = -2\beta m\dot{x}$$

Equation of motion:

$$\ddot{x} + 2\beta\dot{x} + \omega_0^2 x = 0$$

② Driving force $F(t)$ (arbitrary form)

Then
$$\ddot{x} + 2\beta\dot{x} + \omega_0^2 x = \frac{1}{m}F(t)$$