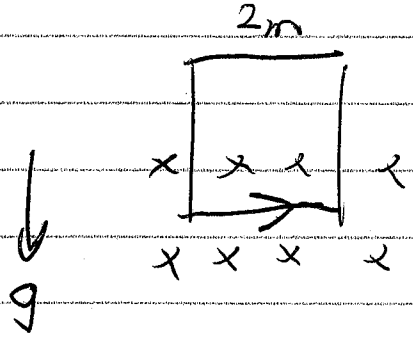
Phys 2426 2015-11-03 Lec 20

Exam 2 #17



$$\Sigma F = 0 = \vec{F_g} + \vec{F_B}$$

$$F_g = F_B$$

$$mg = I\ell B$$

$$I = \frac{mg}{\ell B} = 0.49\ A$$

$$V = IR = 19.6\ V$$

$$\mathcal{E} = vB\ell$$

$$v = \frac{\mathcal{E}}{B\ell} = 1.63\ m/s$$

#21: $V_{rms} = 210\ V$ $R = 26\ \Omega$ $Z = 71\ \Omega$

$$P = P_R = I_R V_R = I^2 R$$

$$V = IZ \Rightarrow I = \frac{210\ V}{71\ \Omega} = 2.96\ A$$

(2)

#19

$$\mathcal{E} = \frac{d\Phi}{dt} = \frac{\Delta \Phi_B}{\Delta t} \qquad \Phi = NBA\cos\theta$$

$$= NA\cos\theta \frac{\Delta B}{\Delta t}$$

$$= (300)(0.2 * 0.2)(1)\left(\frac{0.4}{2.0}\right)$$

#32

$$V_c = I X_C$$

Oscillations - Any back-and-forth behavior.

- Voltage, Current, B Field
- Mass on Spring (Simple Harmonic Osc)
- Pendulum
- Guitar string, drum head
- Air molecule in sound wave

All Oscillations have time-related quantities.

- Frequency (F) in hertz (Hz) = osc/sec
- Period (T) in seconds (s)
- Angular Freq (ω) in radians per sec (s^{-1})

$$f = \frac{1}{T} \qquad \omega = 2\pi f$$

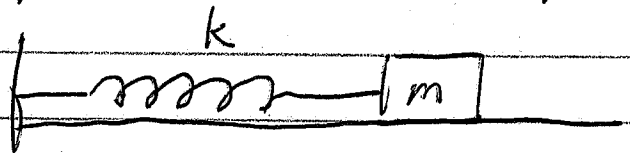
Every Oscillation has an oscillating quantity.

- The <u>Amplitude</u> is how far it deviates from its <u>equilibrium</u>.

What Causes Oscillations

- Restoring Force
- Some Energy
- Inertia causing overshooting the equilibrium.

Example: Mass on a spring



$$F_s = -kx = ma \qquad a = \frac{-k}{m}x$$

$$\frac{d^2x}{dt^2} = \frac{-k}{m}x$$

Solution: $x = A\sin(\omega t + \phi)$

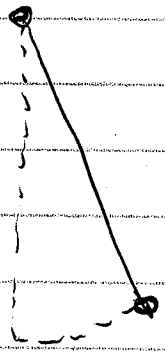
Works if $\omega = \sqrt{k/m} = 2\pi f$

$$f = \frac{1}{2\pi}\sqrt{k/m}$$

Bigger = slower

(5)

Pendulum - rock on a string



Torque $\propto$ -Angle

$$f = \frac{1}{2\pi}\sqrt{\frac{g}{L}}$$

Ex: Want a period of 2.0 s.

$$f = 0.5 \text{ Hz}$$

$$f = \frac{1}{2\pi}\sqrt{\frac{g}{L}}$$

$$(2\pi f)^2 = \frac{g}{L}$$

$$L = \frac{g}{(2\pi f)^2} = \frac{9.8}{\pi^2}$$

$$L = 0.993 \text{ m}$$