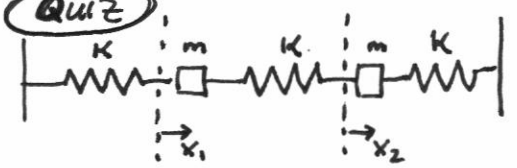
PH 427, 2013

Quiz



$m\ddot{x}_1 = ?$

$m\ddot{x}_2 = ?$

DAY 3

DESCRIBING A NORMAL MODE WITH ONE NUMBER, k.

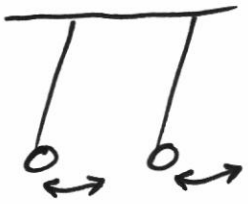
Recall that a normal mode is a pattern of motion.

I claim that the normal modes of a 1d periodic system of harmonic oscillators always follow the same pattern:

$$x_n(t) = A \sin(\omega t) \sin(kna)$$

- x_n: The n^{th} mass in the chain
- ωt: depends on which normal mode $\omega = \omega(k)$
- kna: once I specify k, I have described the mode.
- a: periodic spacing distance.

Full description of the normal mode	k value describing the normal mode	Check the k value



$$x_1 = B \sin \omega_A t$$

$$x_2 = B \sin \omega_A t$$

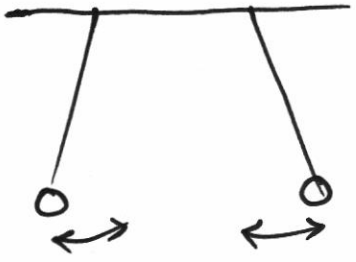
$$k = \frac{\pi}{3a}$$

$$x_1 = A \sin \omega_A t \sin\left(\frac{\pi}{3a} a\right)$$

$$= B \sin \omega_A t$$

$$x_2 = A \sin \omega_A t \sin\left(\frac{2\pi}{3a} a\right)$$

$$= B \sin \omega_A t$$



$$x_1 = B \sin \omega_B t$$

$$x_2 = -B \sin \omega_B t$$

$$k = \frac{2\pi}{3a}$$

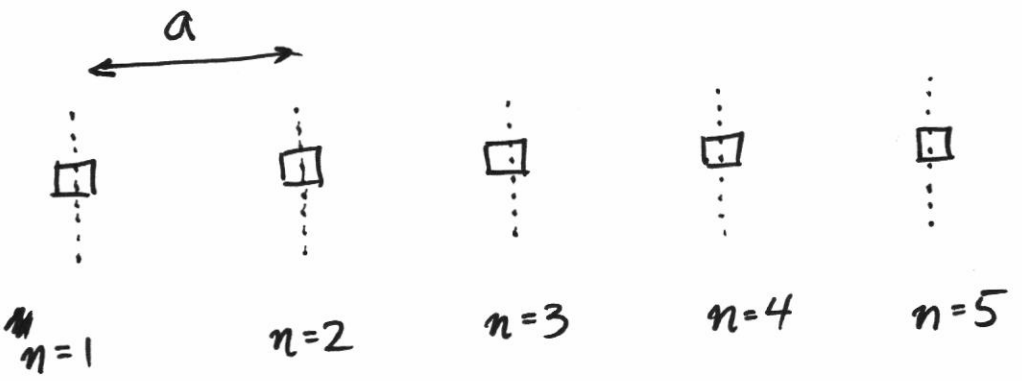
$$x_1 = A \sin \omega_B t \sin\left(\frac{2\pi}{3a} a\right)$$

$$= B \sin \omega_B t$$

$$x_2 = A \sin \omega_B t \sin\left(2 \frac{2\pi}{3a} a\right)$$

$$= -B \sin \omega_B t$$

Exercise



Displace the masses so that a normal mode with $k = \frac{\pi}{6a}$ will be excited.

Return to the work sheet.