Announcements

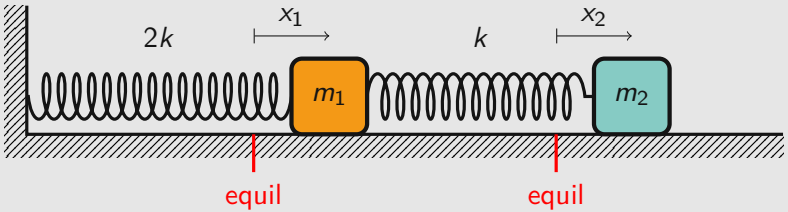
- Homework 10 due Monday
- HW 11 is only 3 problems, and will go out on Monday
- Last CompDay on Monday!
- Don't forget to be thinking/reading through your Final Chapter!
- Responses: `rembold-class.ddns.net`

Today's Objectives

- Identifying what appearance coupled oscillators can have
- Realizing the basic form of solutions to coupled oscillator equations
- Finding normal modes and frequencies

Q1

Consider the situation shown below, where we have chosen the coordinates x_1 and x_2 to represent the distance of each mass from its equilibrium point. What expression best describes the force on m_1?



A) $m_1\ddot{x}_1 = -2kx_1 + k(x_1 - x_2)$

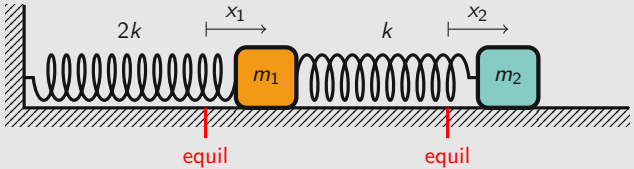
B) $m_1\ddot{x}_1 = -2kx_1 - k(x_1 - x_2)$

C) $m_1\ddot{x}_1 = -2kx_1 + k(x_1 + x_2)$

D) $m_1\ddot{x}_1 = -2kx_1 - k(x_1 + x_2)$

Q2

Given the same system of coupled oscillators, what then would the $\vec{\mathbf{K}}$ matrix look like to describe the system of differential equations?



A) $\begin{bmatrix} -3k & k \\ k & -k \end{bmatrix}$ B) $\begin{bmatrix} 3k & k \\ k & k \end{bmatrix}$ C) $\begin{bmatrix} 3k & -k \\ -k & k \end{bmatrix}$ D) $\begin{bmatrix} 2k & -k \\ 3k & k \end{bmatrix}$

Q3

Suppose that $m_1 = m_2 = m$, so we have:

$$\vec{\mathbf{K}} - \omega^2 \vec{\mathbf{M}} = \begin{bmatrix} 3k - \omega^2 m & -k \\ -k & k - \omega^2 m \end{bmatrix}$$

If $m = k = 1$, which of the following would describe one of the normal frequencies of the system?

A) 0.59 rad/s
B) 1.85 rad/s
C) 3.41 rad/s
D) 4.20 rad/s

Q4

Find the normal mode that corresponds to $\omega_1 = 1.85$. What description below best describes what this normal mode would correspond to?

A) As the first mass moves right, the second mass moves right over twice as far
B) As the first mass moves right, the second mass moves left over twice as far
C) As the first mass moves right, the second mass moves right under half as far
D) As the first mass moves right, the second mass moves left under half as far