Review: Ch 14 Oscillations

Note: Midterm 1 is on Tuesday (04/27/2021), covering chapters: 14, 15, 16, & 31

Objective:

- Destroy this upcoming Midterm 1. Let's gooooo!!!!

  Okay but for real tho, let's try to nail down the following:

  - ☐ Apply the **displacement function** and **Cons. of Energy** for a spring-mass
  - ☐ Finding the **resonant frequencies** (harmonics & overtones) for a guitar string.

Contextualizing the Formula Sheet [10mins]

1) This equation represents _____ as a function of _____

$$x(t) = A\cos\omega t + \phi$$

2) The angular frequency ω can be expressed/rewritten in the following ways

$\omega =$ $=$ $=$ $=$

3) The **total energy** E_{total} of an oscillating spring-mass system can be written as

$$E_{\text{total}} = \_\_\_\_\_ + \_\_\_\_\_$$

However, the total energy can also be expressed as

$$E_{\text{total}} = \quad =$$

This principle is called _____

Group Activity (Leader - Student) [15mins]

Oscillating Spring-Mass

A $1.0\,\mathrm{kg}$ block oscillates on a spring with spring constant $20\,\mathrm{N/m}$. At $t = 0\,\mathrm{s}$, the block is $20\,\mathrm{cm}$ to the right of the equilibrium position and moving to the left at a speed of $100\,\mathrm{cm/s}$.

(a) Determine the period

(b) Determine the amplitude

Solution

the answer comes from within

Group Activity (Student - Leader) [15mins]

Guitar String

A guitar string is $90\,\mathrm{cm}$ long and has a mass of $3.16\,\mathrm{g}$. From the bridge to the support post, the length of the string is $60\,\mathrm{cm}$ and the string is under a tension of $520\,\mathrm{N}$.

- Determine the fundamental frequency and the first two overtones.

Solution

$f_1 = 321\,\mathrm{Hz}, \quad f_2 = 642\,\mathrm{Hz}, \quad f_3 = 963\,\mathrm{Hz}$