Quiz 1-B

1. Consider two identical masses hanging from identical springs. One system is lightly damped by air resistance, while the other is heavily damped by a nearby magnet (just like in lecture). Both springs are stretched and released, and they proceed to oscillate up and down.

(a) Which of the above plots of displacement vs. time (A or B) corresponds to the heavily damped system?

(b) Using motors, we can drive both spring systems at a variety of frequencies. For each driving frequency, we record the amplitude of the response, resulting in the resonance curves below:

Unfortunately, we neglected to label the plots and have since forgotten which is which. Using what you know about resonances, identify which plot (C or D) corresponds to the heavily damped system, and clearly explain how you know which one it is (continue on the next page if you run out of room).
2. You pluck a guitar string and hear the note A₂, whose frequency is 110 Hz.

(a) What are the frequencies of the next three harmonics present in the string’s sound?

(b) The string is 0.65 m long. What is the speed of waves along the string?

(c) Are the waves along the string transverse or longitudinal?