PHYS 214 Section 2 – Spring 2007, Test 1

Practice problems taken from tests given in the 2005–2006 academic year

Questions

1. It can be said that standing wave patterns are due to "interference in space," whereas beats are due to "interference in time." Explain what this means.

2. You are listening to music from a loudspeaker, and someone doubles the power emitted by the amplifier-speaker system. Does the sound intensity double? Does the music you hear sound twice as loud?

3. What evidence do we have that light is made of waves? What evidence do we have that those waves are transverse?

3. Suppose you are looking at a soap bubble and you notice that one particular spot on the bubble is red, but the soap is colorless and the light falling on it is white light. Why does that spot appear red?

Problems

1. A guitar string has a total length of 90 cm and a mass of 3.8 g. In the guitar, the distance between the bridge and the support post is $L = 62$ cm, and the string is under a tension of 540 N.
(a) What are the frequencies and wavelengths of the fundamental and the second harmonic?
(b) The sound from the guitar travels in air and reaches your ears. What are the frequencies and wavelengths in air of the sound waves produced by the fundamental and the second harmonic?

2. A teacher is standing inside a building, well back from an outside doorway 90 cm wide, and blows a whistle of frequency 750 Hz. Ignoring sound reflections, estimate the value of an angle at which it is not possible to hear the whistle clearly on the playground outside the doorway.

3. Some rearview mirrors produce images of cars behind you that are smaller than they would be if the mirrors were flat. Are the mirrors concave or convex? If a mirror produces images of cars 20.0 m away that are half of their normal size, what is the mirror's radius of curvature? Calculate the answer and draw a ray diagram to represent the situation.

4. A camera with a 50-mm focal length lens can take focused photograph of objects from very large distances down to 50.0 cm from the camera, but not any closer. What can you conclude about the range of allowed distances between the lens and the film? In addition to the relevant calculations, draw a ray diagram showing the situation in which the object is 50.0 cm away.