

## Physics 223

### Interference of waves assignment

OVERVIEW: Waves are everywhere and many things we observe are connected with the interference of waves. Roughly a century ago, we learned this is even more true than we had thought, since all matter is composed of waves.

How do waves interfere? Look at three cases.

- 1) Waves interfering along a straight line, such as transverse waves on a string. This kind of interference produces standing waves. This is covered in FlipItPhysics.
- 2) Waves interfering in two directions when the observing distances are not too different from the wavelengths. This is often true for sound waves coming from two loudspeakers.
- 3) Waves interfering in two dimensions when the wavelengths too small to be directly noticed. This is usually true for interference of light waves.

READING: In Serway and Jewett, 6<sup>th</sup> edition, read:

- 1) Chapter 18, sections 1 and 2 (pages 544 through 552). This covers case 1 and 2 above.
- 2) (Optional) Chapter 18, section 3 (pages 552 through 557). This covers standing waves on strings which is also covered in FlipIt Physics (but you might want to read it anyway).
- 3) Chapter 37, sections 1, 2 and 3 (pages 1177 through 1184). This covers interference in two dimensions when the wavelengths are small and the observations are far away (thousands of wavelengths away).

### THE KEY THING TO UNDERSTAND:

Look at figure 18.6 and figure 37.5. You should be able to see that these are pictures of the same thing and interference is happening for the same reason. The only difference is that in chapter 18, distances are large enough that we can measure them directly. In chapter 37, the wavelength of light is so small that we can't measure distances accurately with ordinary rulers and meter sticks so we have to use angles and trigonometry.

### HOMEWORK PROBLEMS:

Chapter 18, page 571, problems 8, 9, and 10.

Chapter 37, pages 1197 and 1198, problems 5, 6, 7

SOLUTIONS can be found here:

<http://www.instruction.greenriver.edu/physics/keith/223/solutions.htm>

Type the word "interference" in the password box.

(Don't click the print button! These are big files. Print one page at a time if you need to.)