PH1140 D09, Homework 6 [260 points]

Due April 24, 2009 in lecture. Please put your homework in the 1140D boxes outside OH 107 (note the section numbers on the boxes).

1. [30] A train of 2D line waves of wavelength $\lambda = 0.59\ cm$ travel in the $+x$ direction, strike barrier at $x = 0$ and pass through two small slits located at $y = \pm 8.5\ cm$. Consider the interference pattern created by the waves at distances $r \gg d$.
a) [10] Determine the 7th angle at which the waves from the two slits combine constructively.
b) [10] Determine the 7th angle at which the waves from the two slits combine destructively.
c) [10] What is the path difference r_{dif} and phase difference φ_{dif} at the location $x = 3.8\ m, y = 0.7\ m$?

2. [30] An inbound traveling circular wave on a membrane has amplitude $A = 0.2\ cm$ and wavelength $\lambda = 1.49\ cm$ at $r = 19\ cm$.
a) [10] Calculate the average power density of the wave if the membrane tension is $F = 3.5\ N/m$ and the membrane mass density is $\sigma = 26\ g/m^2$.
b) [10] What is the average power density at $r = 27\ cm$?
c) [10] What is the average power density at $r = 14\ cm$?

3D Sound Waves

3. [30] Work Y&F Exercise 16.1.

4. [20] Work Y&F Exercise 16.5.

5. [30] Work Y&F Exercise 16.14.

6. [20] Work Y&F Exercise 16.25.

7. [20] Work Y&F Exercise 16.31.

8. [30] Work Y&F Exercise 16.34.

9. [20] Work Y&F Exercise 16.38.

10. [30] Work Y&F Exercise 16.43.

Suggested Exercises:
Y&F 16.2, 16.6, 16.21, 16.32, 16.45