Mathematics 309 — Spring 2004 — Fifth homework

Due Wednesday, March 10.

1. When you look at an object through a piece of flat glass, where does it **seem** to be (in terms of the thickness of the glass and its index of refraction n)?

2. Place a red object at a depth of one meter under water. Draw on a single page the wave front of light rays at an optical distance of 1 m, 1.5 m, 2 m., both exact and according to the linear theory. Place the object at the bottom of a page, 5 cm = 1 m. Find the exact equation of the wave front surface outside the water at optical distance d.

3. An object is placed at $x = -7$ in front of a hemispherical lens of radius 3 whose centre is $(0, 0)$. Draw the exact and linear wave fronts at optical distance 4, 5.5, 7, 8.5 from the object by plotting points on the 11 rays at angles $\pm i/100$ radians for $0 \leq i \leq 10$.

4. Horizontal light rays enter a drop of water of radius 1. Draw the wave front at an optical distance of 0.4 from the point furthest left on the drop. Do this by locating points on 10 rays at heights 0, 0.1, $\ldots 0.9$.