Homework 4

Question 1 (parts a, b and c); 2 (parts a and b).

## 1. Air & Water Interface

This question concerns reduced thickness. A cat is observing a fish swimming in a pond.

(a) The fish is 500mm beneath the surface of the water ($n = 1.33$). For the cat observing in air, how far below the water's surface does the fish appear to be?

(b) The cat is 500mm above the surface of the water. For the fish observing in water, how far above the water's surface does the cat appear to be?

(c) Several months later (in a place with real winters) the cat returns to watch the fish again. This time, there is a 100mm thick layer of ice ($n = 1.31$) on the surface. The fish is still a total physical distance of 500mm below the surface. Repeat parts a and b (aka determine the apparent distance for the fish and cat).

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## 2. Glass Rod Telescope

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A glass rod is being manufactured into an afocal (telescope) system. Its length must be 150mm and its refractive index is 1.5. From what you know of the Galilean and Keplerian telescope systems, calculate the correct radii of curvature for the specifications.

(a) For a magnification of -0.5

(b) And a magnification of +0.5