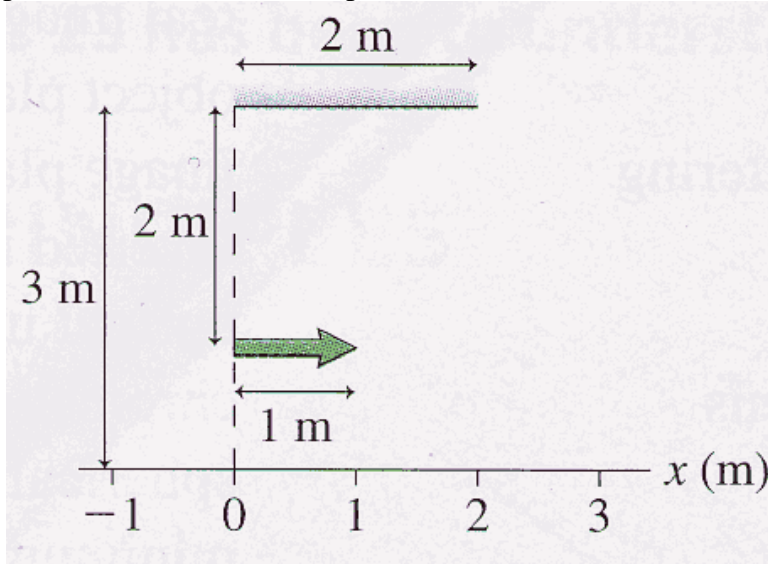


Phys 375 – Monday/Wednesday sections – Prof. Fuhrer
Homework #2, due week of September 17-18, 2008

1) Pedrotti, problem 2-7:

“A small source of light at the bottom face of a rectangular glass slab 2.25 cm thick is viewed from above. Rays of light totally internally reflected at the top surface outline a circle of 7.60 cm in diameter on the bottom surface. Determine the refractive index of the glass.”

2) The picture below shows the top view of a room. You are walking along the x-axis.



a) What is the set of values for x for which you can see the entire green arrow in the mirror (blue slab at top)?

b) Draw the image of the arrow in the mirror.

3) Pedrotti, problem 2-8.

“Show that the lateral displacement of a ray of light penetrating a rectangular plate of thickness t is given by

$$s = \frac{t \sin(\theta_1 - \theta_2)}{\cos \theta_2}$$

where θ_1 and θ_2 are the angles of incidence and refraction, respectively. Find the displacement when $t = 3$ cm, $n = 1.50$, and $\theta_1 = 50^\circ$.”

4) You set up an experiment to measure the angle of incidence θ_1 and refraction θ_2 for light entering a plastic block. The light ray is incident from air, and you can assume the index of refraction for air is 1.0003 (exact). You measure:

$$\theta_1 = 42^\circ \pm 0.3^\circ \quad \theta_2 = 25^\circ \pm 0.3^\circ$$

- a) What is the measured index of refraction for the block, and standard deviation?
- b) The error in which angle's measurement contributes most to the error in the index of refraction?