Optics I: Theory CPHY 6/72250
Assignment 1.

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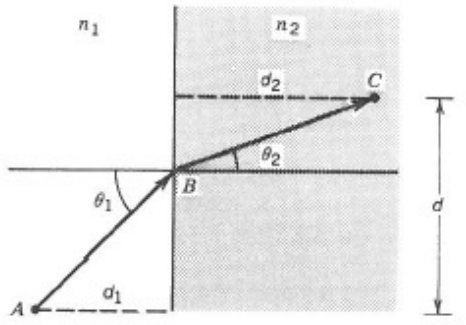
Due: Sept. 12, 2017

1. What length plane mirror must you purchase to see your full height when it is mounted in a vertical position? (Do not assume that you have eyes on the top of your head.) Make a sketch, and label distances.

2. Consider the planar interface shown.



   Show that the optical path length from A to C is minimized if

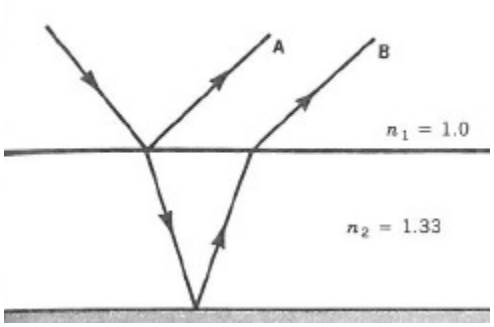
$$n_1 \sin\theta_1 = n_2 \sin\theta_2 \tag{1}$$

   This is Snell's Law.

3. Consider a series of plane interfaces, all parallel. At the first, the index changes from n_0 to $n1$; at the second, it changes from n_1 to n_2; at the mth from n_{m-1} to n_m. If θ_m is the angle of refraction and θ_{m-1} is the angle of incidence at the mth interface, show that

$$n_0 \sin\theta_0 = n_m \sin\theta_m \tag{2}$$

4. A collimated laser beam shines on a tank of water. Part reflects from the surface (beam A) and part reflects from the bottom, and exits the water as beam B.



Show that the beams are parallel.