Homework 8:

Consider a slab of glass with index of fraction n located in front of a convex mirror of radius R. Suppose the slab is of thickness $R/2$ and is located so that it sits between R and R/2 from the mirror as in the figure below.
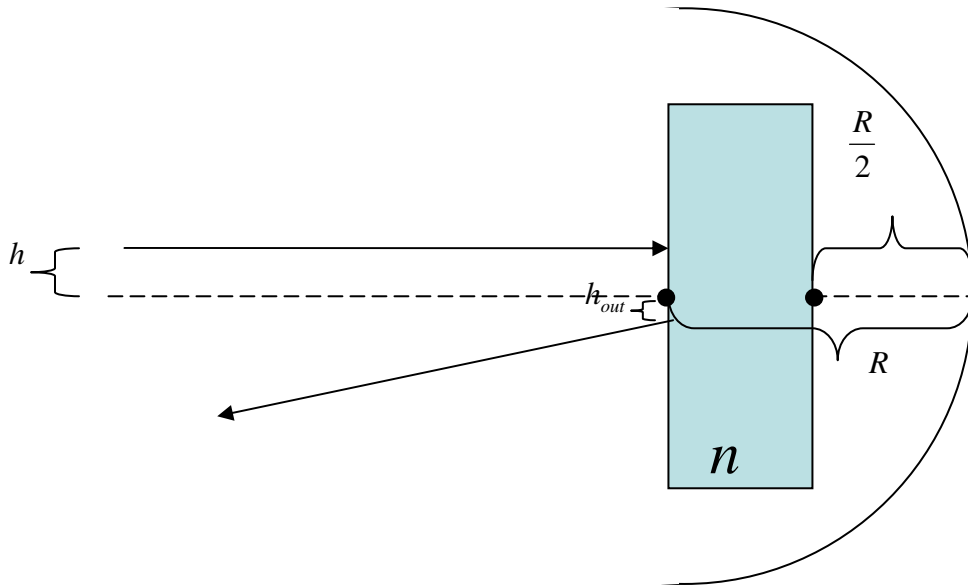
Suppose a ray of light parallel to the symmetry axis and located a distance h above comes in from the left. (You may assume that h is much smaller than R.)The ray passes through the slab reflects from the mirror and passes through the slab a second time. It will ultimately leave the slab some distance h_{out} below the axis at some angle θ. The purpose of the problem is find h_{out} and θ.

a) As a first step explain why the ray passes through the slab the first time with out bending.

b) Next show that after reflection the ray hits the front end of the slab on the axis with an angle of $2h/R$ (measured in radiians . (Hint: where is the focal point? .)

c) Find the angle of the ray as it passes through the slab the second time. The angle are small enough so that when using Snell's law one can replace the Sine's of angles by the angles.

d) Finally find h_{out} and θ.