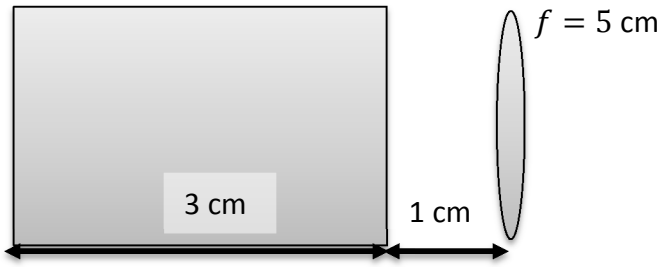
ECE 414 – Spring 2016
Homework #4

Out: 01.28 Due: 02.04

1. A simple optical setup involves a 3 cm-thick piece of glass and a thin lens, separated by 1 cm of air. Both the lens and glass have a refractive index of 1.5. The thin lens has a focal distance of 5 cm.



a) Find the "ABCD" matrix for this simple optical system.
b) What is the determinant of this matrix?
c) A ray enters this system (from the left) a distance of 1cm above the axis with a slope of zero. Describe the slope and distance from the axis of the outgoing ray.
d) Make a quick sketch of this outgoing ray – labeling the values found part c).
e) What is the effective focal length of this whole system?

2. (Problem 1.4-2) Ray-Transfer Matrix of a GRIN plate. Determine the ray-transfer matrix of a SELFOC plate [i.e., a graded-index material with parabolic refractive index $n(y) = n_o\left(1 - \frac{1}{2}\alpha^2 y^2\right)$] of width d, as shown in the diagram below.