PHY431, Homework 3 DUE: Feb 2 2017

Thin lenses, mirrors

1. (3 pts) An object is placed 10 cm in front of a converging thin lens of focal length 10 cm. A diverging lens of focal length -15 cm is placed 5 cm behind the converging lens. Find the position and magnification of the image. Is this a real or virtual image?
2. (3 pts) A spherical concave shaving mirror has a radius of curvature of 12 inches. What is the magnification when the face is 4 inches from the vertex of the mirror? Include a ray diagram of the image formation.
3. (4 pts) There are several varieties of retro-reflectors that are commercially available; one type is comprised of transparent spheres, the back of which are silvered. Incoming light is refracted at the front surface, focused onto the rear surface, and then reflected back out in the same direction it came in. In order for this to happen, determine the necessary index of refraction for a sphere of radius R. Assume the incident light rays are parallel and the retro-reflector is in air.