

SIMG-303-20033 Homework #6
Due W, 4/28/2004

0. Read Hecht Chapter 5 and 6 on *Geometrical Optics*.
1. An optical system consists of thin lenses L_1 ($f_1 = 100$ mm) and L_2 ($f_2 = 200$ mm) separated by $d = 800$ mm. Locate and describe the image of an object that is 50 mm high located 150 mm "in front" of the first lens.
2. A system consists of thin lenses L_1 ($f_1 = -60$ mm) and L_2 ($f_2 = ?$) separated by $d = 120$ mm. Lens L_2 is made of glass with $n = 1.5$ and is plano-convex with radius $r = 60$ mm for the curved side. Locate and describe the image of an object that is 5 mm high located 180 mm "in front" of the first lens.
3. A thin lens is made of glass with index $n = 1.53$. In air, the lens has a focal length $f = 254$ mm. What is its focal length when it is totally immersed in water ($n = 1.33$)?
4. The surfaces of a thin equiconvex lens have equal radius of curvature: $|R_1| = 150$ mm. The second surface is aluminized so that it is a mirror. Find the location of the image of an object located 400 mm to the left of the first surface.
5. Two thin lenses of focal lengths $f_1 = -50$ mm and $f_2 = +100$ mm are separated by a distance $d = 50$ mm. Find the focal length of the system of thin lenses and locate the principal points.
6. The solar telescope at the Kitt Peak National Observatory has a primary mirror with a diameter of 60 in. The image formed by this mirror is 300 ft away. If the diameter of the sun is 864,000 mi and its distance is 93,000,000 mi. Find the diameter of the image of the sun in mm.
7. Consider an optical system composed of two thin lenses, each with focal length of 100 mm. The first lens is located at the front focal point of the second. Find the focal length, focal points, and the principal points of the system. If the focal length of the first lens is changed, determine the effect on these parameters of the system.
 - (a) (OPTIONAL BONUS) Describe any applications for this optical system.