1. Do the following problems from pages 190-191 of your text.
   7-9, 7-13, 7-16, 7-18b (assume $\theta_m = 0^\circ$, and solve for the 1st order only)

2. Light travels from air into a flat transparent material. The angle of incidence is $30^\circ$ from the
   surface normal, while the angle of the transmitted light is $19.1^\circ$. What is the refractive index of
   the material?

3. At what distance from a lens does an object have to be, so that the image is twice as large as
   the object?

4. The highest optical throughput monochromator that is commercially available has an $f/\# = 3.5$.
   If the monochromator focal length is 25 cm, what is the diameter of the collimating mirror? A
   monochromator in a Czerny-Turner configuration has two such mirrors and a grating. If the
   mirrors touch each other side-to-side, what is the minimum physical dimension of the
   monochromator (the purpose of the question is to get some idea of the physical size of the
   device)? Give the answer rounded up to the nearest whole inches so you can easier picture the
   size.

5. Estimate the extent of chromatic aberration by calculating the difference in focal length for a
   biconvex flint glass lens ($R_m = +100$ cm, $R_{out} = -100$ cm). Let $n_{397} = 1.705$ and $n_{650} = 1.644$.
   Wow, what an error!

6. Do question #5 on 2002 Exam 2. See the exam crib for the answer.