Problem Set 2022-4
Physics 265
First Semester, AY 2023– 2024
Release Date: 22 September 2023
Due: 6 January 2024
Ten points per number

The Thick Lens (Section 4.4.3 Born & Wolf)

For the six different types of lenses shown in Figure 4.15 (page 174), please dothe following:

1. Derive explicitly the expression for the power *P* (Equation 26, p 172) of each thick lens considering the possible signs of the two radii of curvature for the first (front) and second surfaces.

2. For the same focal lengths, refractive indices (n_2, $n_1 = n_3$) and radii of curvature (absolute values), rank the six lenses according to their light-gathering power *P*.

3. Derive the expression for the resulting power of the plano-convex (4.15b), convergent meniscus (4.15c), plano-convex (4.15e) and the divergent meniscus (4.15f) lens when the order of their two surfaces is reversed to face the incident light coming from the left side. For the plano-convex lens, the said situation would correspond to having the plane surfaceas the first one to meet the incident light.

4. In focusing an incident beam of parallel rays (plane waves) with a plano-convex lens, which first surface gives better result – the convex or the plane. Briefly explain your answer.

END.