Sect. 34.1, 34.2, and 34.4. **OBJECTIVES** PHYSICS 242 SPRING 2017 BLOCK 12

You may (and should) bring *two* 3" × 5" cards for Exam 12 on April 18 (and/or its makeup on April 20).

TERMS

Be able to define or discuss the following terms with their SI units, if any.

1. object
2. real +
3. image
4. virtual –
5. object distance s
6. image distance s'
7. focal point F
8. focal length f
9. concave mirror R, f are +
10. convex mirror R, f are –
11. lateral magnification m
12. principal rays
13. converging lens f is +
14. diverging lens f is –

EQUATIONS

Understand the meaning and know the SI units of all the symbols in these equations—and be able to use the equations to solve problems.

1. Eq. (34.5)
2. Eqs. (34.6) and (34.16)
3. Eqs. (34.7) and (34.17)
4. Eq. (34.19)

SKILLS

Use the material in these sections to be able to:

1. apply our sign conventions for mirrors and for thin lenses.
2. use $R = \infty$ and/or $\frac{1}{R} = 0$ for flat (plane) surfaces of our mirrors or thin lenses.
3. from the value of the lateral magnification m, state whether the image is erect or inverted and whether it is enlarged, reduced, or the same |height| as the object.
4. trace at least two principal rays from the point of a real object arrow to locate and draw the image arrow formed by a mirror or by a thin lens, thus finding the approximate position, size, and character of the image. Examples for mirrors include Figures 34-19a (or 34-20a or 34-20b), 34-20d, and 34-19b. Examples for lenses include Figures 34-36a (or 34-37a or 34-37b or 34-37c), 34-37e, and 34-36b.
5. realize that, since light passing through a higher (than its surroundings) index of refraction prism or lens is bent toward the thickest part of that prism or lens, such converging lenses are thickest at their centers and such diverging lenses are thinnest at their centers.

SUMMARY For **Real** Objects (s is +)

1. For plane mirrors (R and f are both ∞). The image is *always* virtual (s' is –), the same distance behind the mirror as the real object is in front of it ($s' = -s$), erect (m is +), and the same height as the object ($m = |m| = 1$).
2. For spherical convex mirrors (R and f are both –) *and* diverging lenses (f is –): The image is *always* virtual (s' is –), erect (m is +), and reduced ($m = |m| < 1$).
3. For spherical concave mirrors (R and f are both +) *and* converging lenses (f is +):

a) If $s < f$ (if the real object is between a focal point and the mirror/lens): The image is *always* virtual (s' is –), erect (m is +), and enlarged ($m = |m| > 1$).

b) If $s > f$ (if the real object is outside a focal point): The image is *always* real (s' is +) and inverted (m is –). Furthermore, if $s > 2f$, it is reduced; if $s = 2f$, it has the same |height| as the object; and if $2f > s \geq f$, it is enlarged.

Page 1117, Fig. 34.13a), caption: Change "All" to "These" because the rays that reflect through F are *only* those both parallel to and close to the spherical mirror's axis.

Page 1121, principal ray # 2: Change "through (or proceeding toward)" to "through, away from, or proceeding toward".

Page 1121, principal ray # 3: Change "through or away from" to "through, away from, or proceeding toward".

Page 1122, line 1: Insert "real or virtual" before "image" and also before "intersection". In the last sentence of the CAUTION: Insert "two of" after "need to draw".

Smooth seas do not make skillful sailors. African Proverb