1. For an object distance \( z = -150 \text{ mm} \), an object space index \( n = 1.5 \), and a front focal length \( f_F = -100 \text{ mm} \), what is the effective focal length \( f \) and the magnification \( m \)? Is the image upright or inverted?

2. For an image distance \( z' = -75 \text{ mm} \), an image space index \( n' = 1.5 \), and a rear focal length \( f_R' = -75 \text{ mm} \), find the effective focal length \( f \) and the magnification \( m \)? The image is at what cardinal point?

3. Given the object distance \( z = -200 \text{ mm} \), an object space index \( n = 1.0 \), and a lens of effective focal length \( f = 60\text{ mm} \), what is the front focal length \( f_F \) and the magnification \( m \)? Draw the system.

4. Given the image distance \( z'_F = 80 \text{ mm} \), an image space index \( n' = 1.0 \), and a lens of effective focal length \( f = 80\text{ mm} \), what is the rear focal length \( f_R' \) and the magnification \( m \)? Draw the system.

5. For an object distance \( z_F = -150 \text{ mm} \), an object space index \( n = 1.33 \), and an effective focal length \( f = -70 \text{ mm} \), what is the front focal length \( f_F \) and magnification \( m \)? Is the front focal point \( F \) to the left or right of the front principal point \( P \)?

6. Given the image distance \( z'_F = 80 \text{ mm} \), the front focal length \( f_F = 20 \text{ mm} \) and the rear focal length \( f_R' = -30 \text{ mm} \), if we want to shift the image plane by \( \Delta z' = 5 \text{ mm} \), what shift in the object \( \Delta z \) is needed?

7. The figure to the right shows two incident and emerging rays from a black box system. Draw the locations of the front and rear focal point, \( F \) and \( F' \), as well as the front and rear principal planes \( P \) and \( P' \).

8. The figure to the right shows shows a ray incident onto a black box system, and three possible emerging rays. Which emerging ray (1, 2 or 3) corresponds to the incident ray? Where is the rear principal plane?