

Physics 262: Exam 1
100 points

1. (25 points) A convex mirror has a radius of curvature with magnitude R . An extended object is placed at a distance $2R$ from the mirror.
 - (a) (10 pts) Indicate the focal point and draw two principle rays to show the image position.
 - (b) (10 pts) What are the image position s' and lateral magnification m ?
 - (c) (5 pts) Is the image real or virtual? Is the image erect or inverted?

2. (25 points) Polarized light emitted from a laser is passed through a polarizer. The polarizer has its polarization direction oriented with angle ϕ with respect to the polarization direction of the laser light. E_0 is the maximum of the electric field of the light from the laser. Consider the light from the laser as a plane wave.
 - (a) (10 pts) What is the intensity before and after the polarizer?
 - (b) (15 pts) What is the maximum B field before and after the polarizer?

3. (15 points) Consider total internal reflection for light traveling in glass towards an interface with water. Draw rays whose incident angles are slightly less and slightly more than the critical angle. Indicate which ray is which. Would the critical angle be larger or smaller if it was a glass to air interface?

4. (15 points) A nearsighted person is looking at a very distant object. Draw the eye and show where the image is located.

5. (10 points) Two plane waves with electric fields

$$\vec{E}_1 = \hat{j}E_0 \cos(kx - \omega t)$$

and

$$\vec{E}_2 = \hat{k}E_0 \cos(kx - \omega t)$$

are combined. Is the resulting wave linearly, elliptically, or circularly polarized? Explain.

6. (10 points) Explain what a birefringent material is.