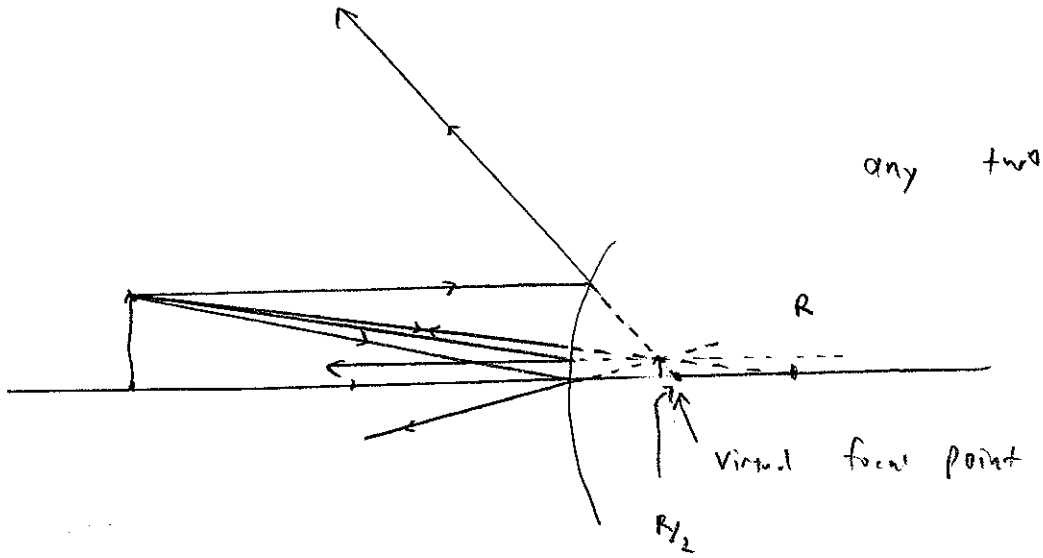
Physics 262 Exam 1 Solutions

(1.)

any two rays

a.)



b.) $\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$ $\qquad f = \frac{-R}{2}$

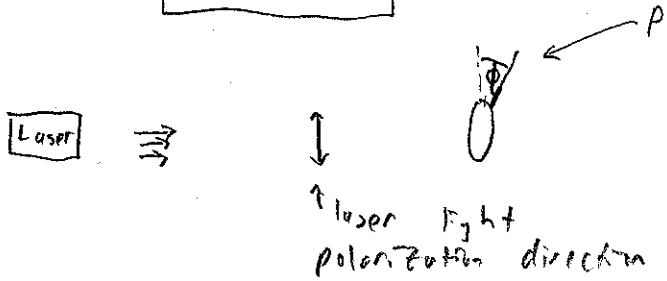
$s = 2R$

$\frac{1}{2R} + \frac{1}{s'} = -\frac{2}{R}$

$\frac{1}{s'} = -\left(\frac{1}{2R} + \frac{2}{R}\right) = -\frac{R + 4R}{2R^2} = -\frac{5}{2R}$

$\boxed{s' = -\frac{2R}{5}}$ $\qquad \boxed{m = -\frac{s'}{s} = \frac{1}{5}}$

(2.)



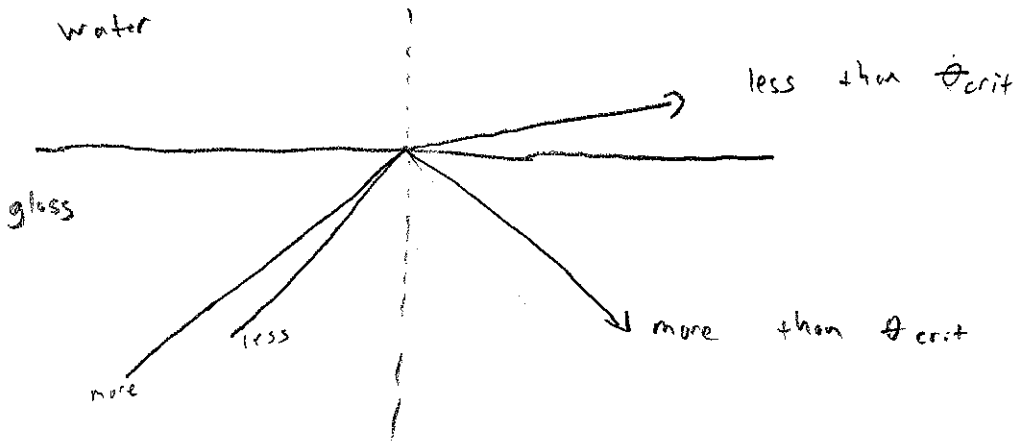
a.) $I_{before} = S_{av} = \frac{E_0^2}{2\mu_0 C}$

$I_{after} = \frac{(E_0 \cos\phi)^2}{2\mu_0 C} = \frac{E_0^2 \cos^2\phi}{2\mu_0 C}$

b.) $E = CB$

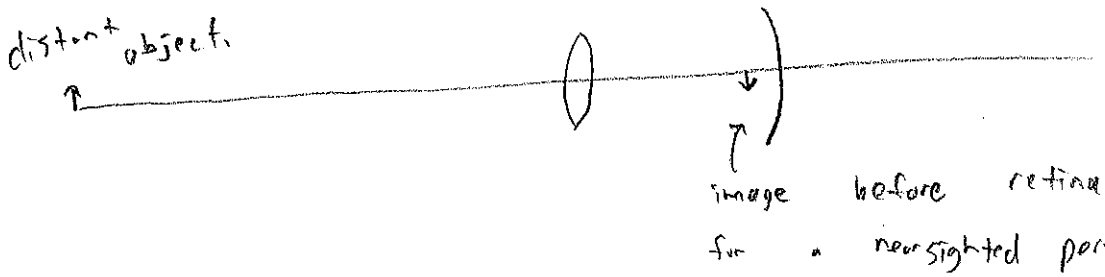
$B_{before} = \frac{E_0}{C}$ $\qquad B_{after} = \frac{E_0 \cos\phi}{C}$

3.



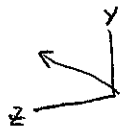
$\sin\theta_{crit} = \frac{n_1}{n_a}$ $\frac{n_b}{n_a}$ is smaller for glass to air than glass to water, so θ_{crit} is smaller.

4.



for a nearsighted person.

5. $\tilde{E}_1$ and $\tilde{E}_2$ are in phase, so the result is linearly polarized light with polarization direction $\pi/4$ from the y-axis in the y-z plane.



6. A birefringent material has two distinct indices of refraction that are associated with the direction of polarization of the light passing through the material.