Example - Exam Solution

1. \( n = 1.5 \quad s = R \)

\[
\frac{1}{f} = (n-1) \left( \frac{1}{R_1} - \frac{1}{R_L} \right)
\]

\( f = \frac{R}{(1.5-1)} = 2R \)

\( R_1 = R \quad R_L = \infty \)

Position is within \( f \), so image is virtual, erect

2. \[
\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}
\]

\[
\frac{1}{s} + \frac{1}{R} = \frac{1}{2R}
\]

To image should be here!

\[
\frac{1}{s'} = -\frac{1}{2R}
\]

\( s' = -2R \)

\[
\frac{m}{s} = \frac{-2R}{R} = -2
\]

\( m = 2 \)
\[ E = R E_0 \cos(kx - wt) \]

d.) Traveling in the positive \( x \)-direction, \( \uparrow \).

b.) Polarized in the \( z \)-direction.

c.) \[ F = PA \]

\[ P = \frac{E}{C} \]

\[ I = \frac{E_0^2}{2M_0 C} \]

\[ F = \left( \frac{E_0^2}{2M_0 C} \right) \left( \frac{1}{C} \right) \cdot A = \frac{E^2 A}{2M_0 C^2} \]
3. Vertical

![Diagram of light reflection]

Reflected light has a larger component of horizontally polarized light, as we can see from the case at Brewster's angle.

4. A half wave plate rotates the polarization direction of linear polarized light by $\pi/2$, giving linearly polarized light out. A slightly shorter wavelength will not give an exact $\pi/2$ rotation, leaving light slightly elliptical, so

5. Wave fronts are surfaces of constant phase.

Rays are perpendicular to wave fronts.

6. For a mirror $f = \frac{R}{2}$,

Plano-convex $\frac{1}{f} = (n-1) \left( \frac{1}{n} - \frac{1}{R} \right) = (n-1) \left( \frac{1}{n} - \frac{1}{R} \right)$

$\frac{1}{f} = \frac{R}{2}$

Plano-convex is longer

3 points of constant zero intensity.