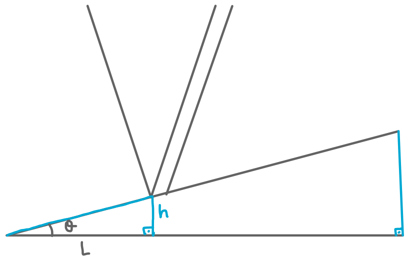
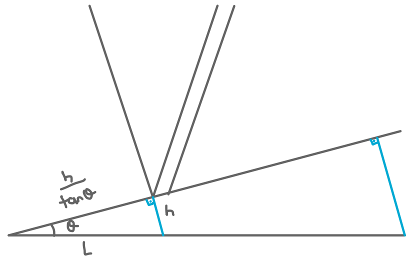
1)

06





$\tan\theta = \frac{h}{L}$

$2h = m.\lambda$ for dark fringes.

$\frac{2h}{L} = \underbrace{\frac{m}{L}}_{n}.\lambda$ (spatial fringe frequency i.e. fringes per length.)

$\frac{2h}{L} = n.\lambda$

$2.\tan\theta = n.\lambda$

$\tan\theta = \frac{n.\lambda}{2}$

$\theta = \tan^{-1}\left(\frac{n\lambda}{2}\right)$

If we take $\frac{h}{\sqrt{h^2+L^2}}$:

$2h = m.\lambda$

$\frac{2h}{\sqrt{h^2+L^2}} = \frac{m.\lambda}{\sqrt{h^2+L^2}}$

$2.\sin\theta = n.\lambda$

$\theta = \sin^{-1}\left(\frac{n.\lambda}{2}\right)$

$\sin\theta = \frac{h}{L}$

$2h = m.\lambda$ for dark fringes

$\frac{2h}{L} = \frac{m\lambda}{L}$

$2.\sin\theta = \frac{m}{L}.\lambda$

$\sin\theta = \frac{n.\lambda}{2}$

$\theta = \sin^{-1}\left(\frac{n\lambda}{2}\right)$

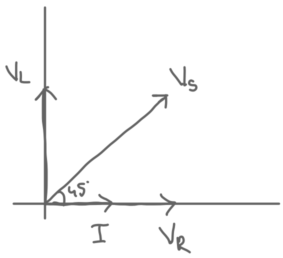
2) $V_{rms} = 200\sqrt{2}$ $\qquad \phi = +45^\circ$

UC $I_{rms} = 1$

$f = \frac{50}{\pi}$

V leads I by $\pi/4$.

" inductor + resistor " needed.



$V_L = V_R$

$I.X_L = I.R$

$X_L = R$

$Z = \sqrt{R^2 + X_L^2}$

$Z = \sqrt{2}\,R$

$\omega = 2\pi f = 100$

$X_L = \omega L$

$Z = \frac{V_{rms}}{I_{rms}} = 200\sqrt{2} = \sqrt{2}\,R$

$R = 200\,\Omega$

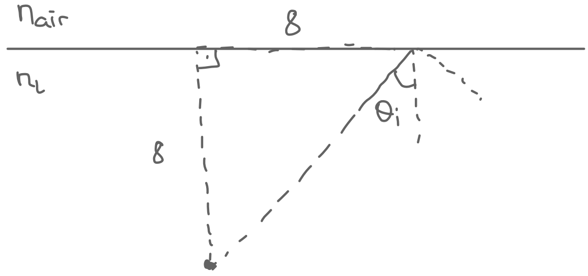
$200\,\Omega = 100.L \Rightarrow L = 2$ Henry

L with 2H

&

R with $200\,\Omega$

3)



$\theta_i = 45$

Total internal reflection is observed.

$\theta_i > \theta_{critical}$ where $\theta_{critical}$ is defined by the following

$$\sin(\theta_{critical}) \cdot n_L = n_{air} \cdot \sin\frac{\pi}{2} = n_{air}$$

$$\theta_{critical} = \sin^{-1}\left(\frac{n_{air}}{n_L}\right)$$

$\sin(\theta_i) > \sin(\theta_{critical})$ since $\sin x$ is an increasing in $(0, \pi/2)$

$$\frac{1}{\sqrt{2}} > \frac{n_{air}}{n_L}$$

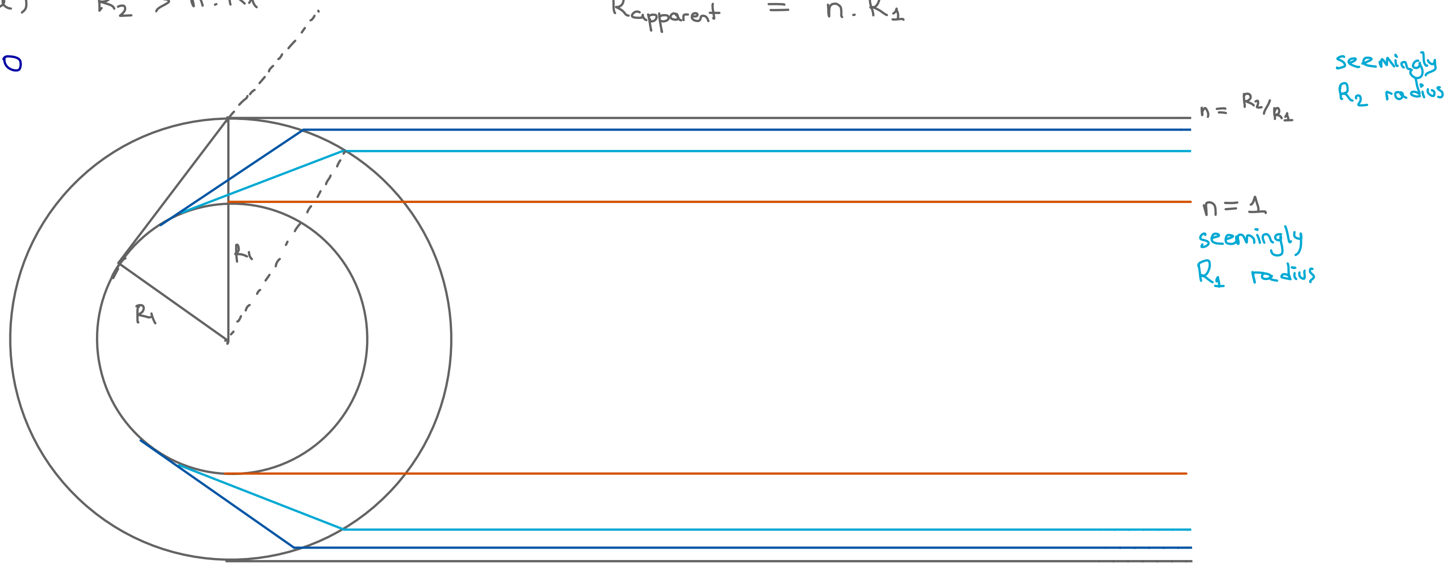
$$n_L > \sqrt{2} \cdot n_{air}$$

One can assume n_{air} to equal 1

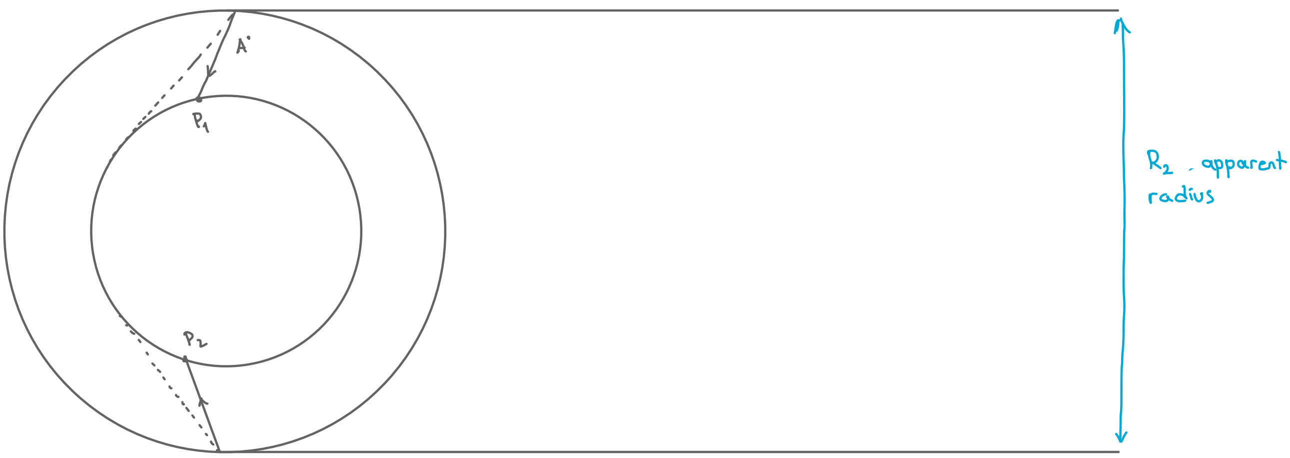
Hence $n_L > \sqrt{2}$

4.a) $R_2 > n \cdot R_1$ $\qquad R_{apparent} = n \cdot R_1$

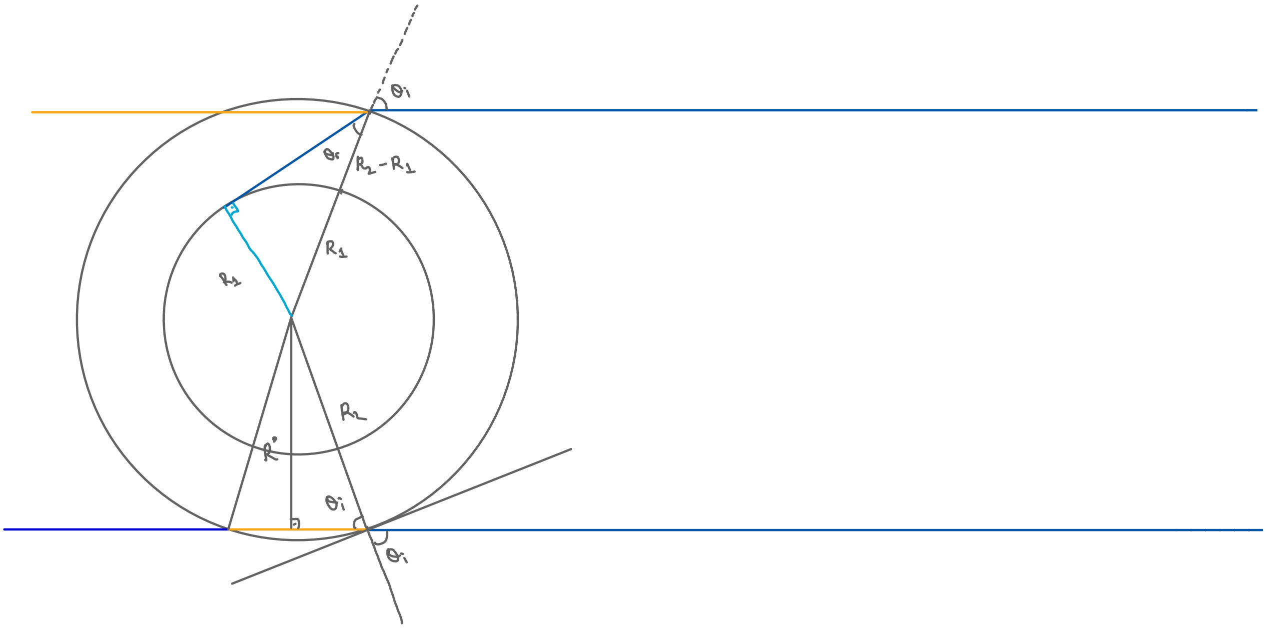
750



4.b) $R_2 < n R_1$



A° : $n > \frac{R_2}{R_1}$, P_1 and P_2 are visible as the topmost and bottommost points.



$$\sin(\theta_i) \cdot 1 = \sin(\theta_r) \cdot n$$

$$\sin(\theta_i) = \frac{R_1}{R_2} \cdot n$$

$$\frac{R^{\circ}}{R_2} = \frac{R_1}{R_2} \cdot n$$

$$\underline{R^{\circ} = n \cdot R_1}$$