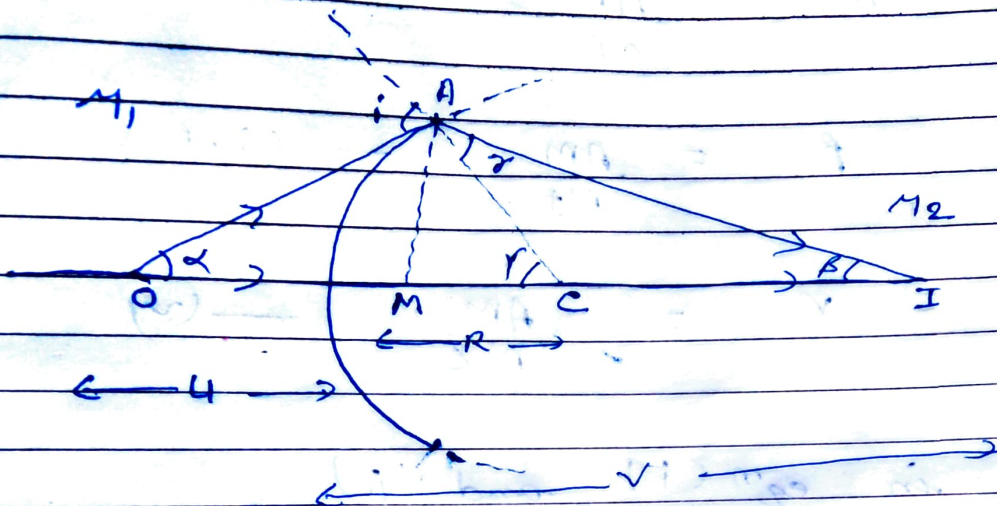


17/4/21

Sueta Sinha

Refraction at a convex surface forms a real image

$$\frac{\mu_1}{u} - \frac{\mu_2}{v} = \frac{\mu_2 - \mu_1}{R}$$



In $\triangle OAC$

Exterior angle = Sum of interior angle

$$i = \alpha + \gamma \quad \text{--- (i)}$$

$$\triangle \quad \gamma = \alpha + \beta$$

$$\alpha = \gamma - \beta \quad \text{--- (ii)}$$

$$\tan \alpha = \frac{AM}{OM}$$

$$\tan \beta = \frac{AM}{MI}$$

$$\tan \gamma = \frac{AM}{MC}$$

$$\tan \alpha \simeq \alpha, \quad \tan \beta \simeq \beta$$

$$\tan \gamma \simeq \gamma$$

$$\alpha = \frac{AM}{OM} \quad \text{--- (iii)}$$

$$\beta = \frac{AM}{MI} \quad \text{--- (iv)}$$

$$\gamma = \frac{AM}{MC} \quad \text{--- (v)}$$

in eqⁿ (i) and (ii)

$$i = \frac{AM}{OM} + \frac{AM}{MC} \quad \text{--- (vi)}$$

$$r = \frac{AM}{MC} - \frac{AM}{MI} \quad \text{--- (vii)}$$

By Snell's law

$$\frac{\sin i}{\sin r} = \mu_2 \quad \left(\mu_2 = \frac{\mu_2}{\mu_1} \right)$$

$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$$

$$\mu_1 \sin i = \mu_2 \sin r$$

$$\mu_1 i = \mu_2 r$$

$$\mu_1 \left[\frac{AM}{OM} + \frac{AM}{MC} \right] = \mu_2 \left[\frac{AM}{MC} - \frac{AM}{MI} \right]$$

$$\mu_1 AM \left[\frac{1}{OM} + \frac{1}{MC} \right] = \mu_2 AM \left[\frac{1}{MC} - \frac{1}{MI} \right]$$

$$\mu_1 \left[\frac{1}{OM} + \frac{1}{MC} \right] = \mu_2 \left[\frac{1}{MC} - \frac{1}{MI} \right]$$

$$\therefore \text{---} \text{---} \text{---} OM = -u, MC = R, MI =$$

$$\mu_1 \left[\frac{1}{-u} + \frac{1}{R} \right] = \mu_2 \left[\frac{1}{R} - \frac{1}{v} \right]$$

$$\frac{\mu_1}{-u} + \frac{\mu_1}{R} = \frac{\mu_2}{R} - \frac{\mu_2}{v}$$

$$\frac{\mu_1}{-u} + \frac{\mu_2}{v} = \frac{\mu_2}{R} - \frac{\mu_1}{R}$$

$$\frac{\mu_1}{u} - \frac{\mu_2}{v} = \frac{\mu_2}{R} - \frac{\mu_1}{R}$$

$$\boxed{\frac{\mu_1}{u} - \frac{\mu_2}{v} = \frac{\mu_2 - \mu_1}{R}}$$

→ x →