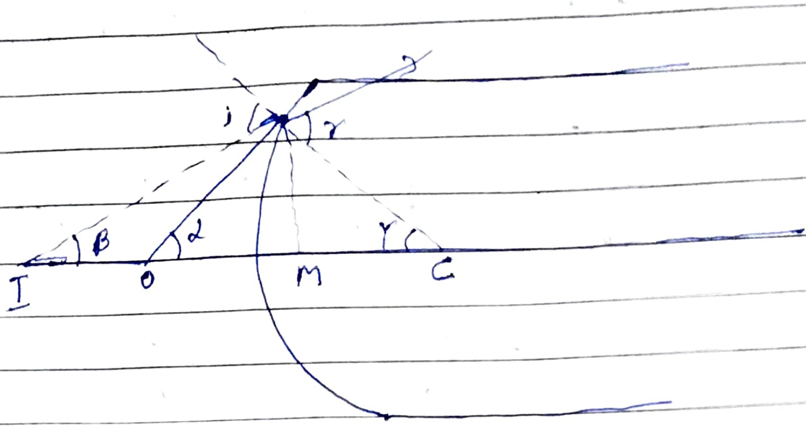
19/4/21

Sweta Sinha

Refraction at a convex surface forms a virtual image

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



From ΔACI

$$r = \beta + \gamma \quad \text{— (i)}$$

from ΔAOC

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

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

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

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

From first oder theory

$$\tan \alpha \simeq \alpha$$

$$\tan \beta \simeq \beta$$

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

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

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

Putting the value of α, β & γ in eqn (i) & (ii)

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

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

By using Snell's law

$${}_1\mu_2 = \frac{\sin i}{\sin r}$$

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

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

$$\mu_2 r = \mu_1 i$$

$$\mu_2 \left(\frac{AM}{MI} + \frac{AM}{MC}\right) = \mu_1 \left(\frac{AM}{OM} + \frac{AM}{MC}\right)$$

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

$MI = -v$, $MC = R$, OM

$$n_2\left(\frac{1}{-v} + \frac{1}{R}\right) = n_1\left(\frac{1}{-u} + \frac{1}{R}\right)$$

$$\frac{-n_2}{v} + \frac{n_2}{R} = \frac{n_1}{-u} + \frac{n_1}{R}$$

$$\frac{n_1}{u} - \frac{n_2}{v} = \frac{n_1}{R} - \frac{n_2}{R}$$

$$\boxed{\frac{n_1}{u} - \frac{n_2}{v} = \frac{n_1 - n_2}{R}}$$