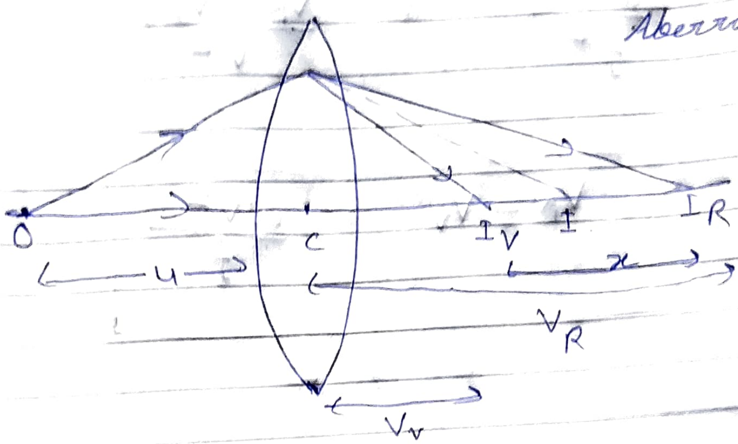
Expression for longitudinal chromatic aberration for an object at finite distance

x = Axial chromatic Aberration



$$x = V_R - V_V$$

By using lens formula

$$\frac{1}{f} = -\frac{1}{u} + \frac{1}{v}$$

For Red image

$$\frac{1}{f_R} = -\frac{1}{u} + \frac{1}{V_R} \quad \text{--- (i)}$$

For violet image

$$\frac{1}{f_V} = -\frac{1}{u} + \frac{1}{V_V} \quad \text{--- (ii)}$$

$$\frac{1}{f_V} - \frac{1}{f_R} = -\frac{1}{u} + \frac{1}{V_V} - \left(-\frac{1}{u} + \frac{1}{V_R}\right)$$

$$\frac{1}{f_V} - \frac{1}{f_R} = \frac{1}{V_V} - \frac{1}{V_R}$$

$$\frac{f_R - f_V}{f_V \cdot f_R} = \frac{V_R - V_V}{V_V \, V_R}$$

$$(f_R - f_v = \omega f) \quad (f_v f_R = f^2)$$

$$[V_v V_R = V^2]$$

$$\frac{\omega f}{f^2} = \frac{V_R - V_v}{V^2}$$

$$\therefore V_R - V_v = \frac{\omega V^2}{f}$$

— x —