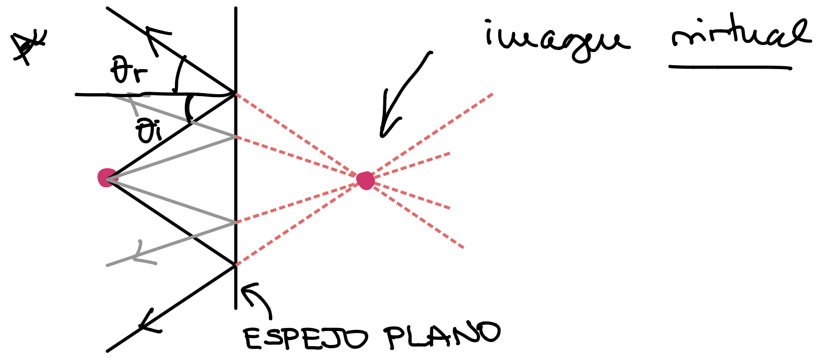
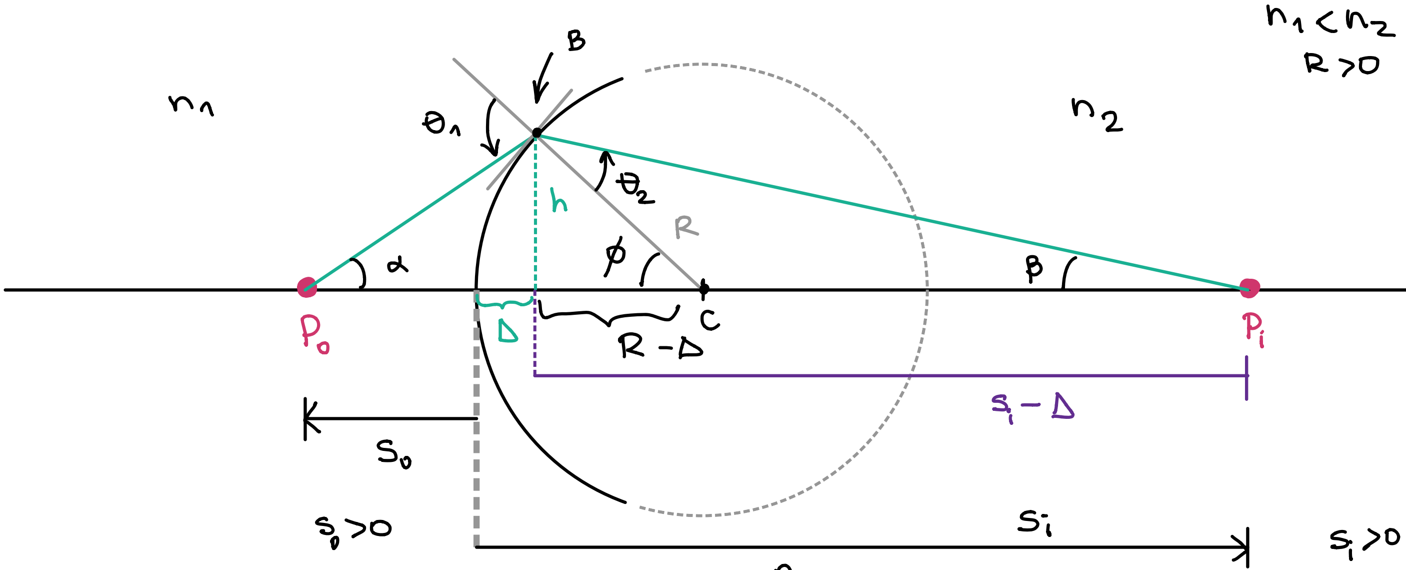
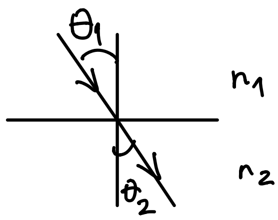


imagen virtual
θ_r
θ_i
ESPEJO PLANO



$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$\uparrow$



$$tg(\beta) = \frac{h}{s_i - \Delta} \qquad tg(\alpha) = \frac{h}{s_o + \Delta} \qquad tg(\phi) = \frac{h}{R - \Delta}$$

$$\theta_1 = \alpha + \phi \qquad \phi = \theta_2 + \beta$$

APROX. PARAXIAL. $\longrightarrow$ $\alpha \ll 1$, $\Delta \ll 1$

$\theta_1 \ll 1 \qquad \theta_2 \ll 1$

$$\sin(\theta) \xrightarrow{\theta \ll 1} \sim \theta \qquad tg(\theta) \sim \theta$$

$$\rightarrow n_1 \sin\theta_1 = n_2 \sin\theta_2 \longrightarrow n_1\theta_1 = n_2\theta_2$$

$$tg\,\beta \sim \beta = \frac{h}{s_i - \cancel{\Delta}} \qquad tg(\alpha) \sim \alpha = \frac{h}{s_o + \cancel{\Delta}} \qquad tg(\phi) \sim \phi = \frac{h}{R - \cancel{\Delta}}$$

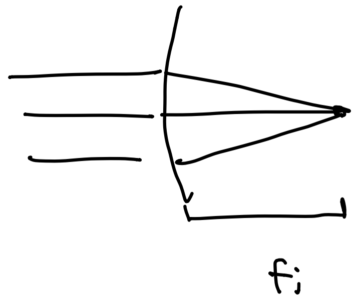
$$\begin{cases} \theta_1 = \alpha + \phi = \dfrac{h}{s_o} + \dfrac{h}{R} \\ \theta_2 = \phi - \beta = \dfrac{h}{R} - \dfrac{h}{s_i} \end{cases} \longrightarrow n_1 h \underbrace{\left(\frac{1}{s_o} + \frac{h}{R}\right)}_{\theta_1} = n_2 h \left(\frac{1}{R} - \frac{1}{s_i}\right)$$

$$\hookrightarrow \frac{n_1}{s_o} + \frac{n_2}{s_i} = \frac{(n_2 - n_1)}{R}$$

es indep. de α!

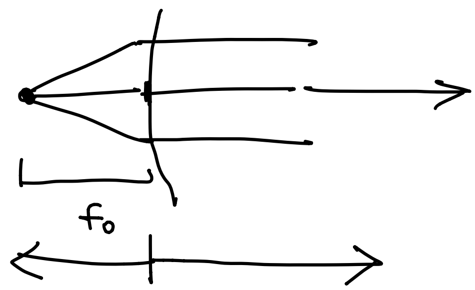
$s_o \to \infty$ } los rayos vienen paralelos

$$\frac{n_1}{\cancel{\infty}} + \frac{n_2}{s_i} = \frac{(n_2 - n_1)}{R} \to \frac{1}{s_i} = \frac{1}{n_2}\frac{(n_2 - n_1)}{R} = f_i$$

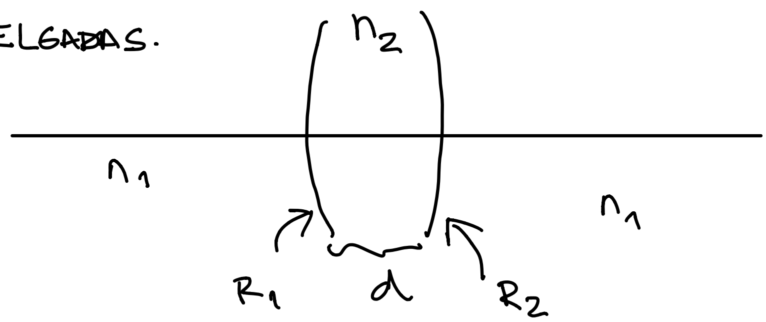


- $s_i \to \infty$; los rayos salgan ∥

$$\frac{n_1}{s_o} + \cancel{\frac{n_2}{s_i}} = \frac{n_2 - n_1}{R} \to \frac{1}{s_o} = \frac{1}{n_1}\left(\frac{n_2 - n_1}{R}\right) \equiv f_o$$



LENTES DELGADAS.



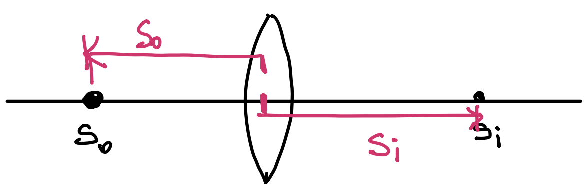
$n_1 < n_2$
aire vidrio

$R_1 > 0$ y $R_2 < 0$ por convención

$d << 1$

$$\frac{1}{s_o} + \frac{1}{s_i} = (n - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right) \quad \text{con } n = \frac{n_2}{n_1}$$

EC. de LENTE DELGADA.



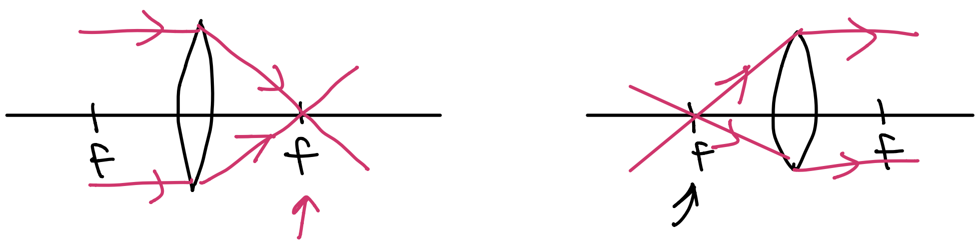
tanto si s_o o $s_i \to \infty$; $f_i = f_o \equiv f$

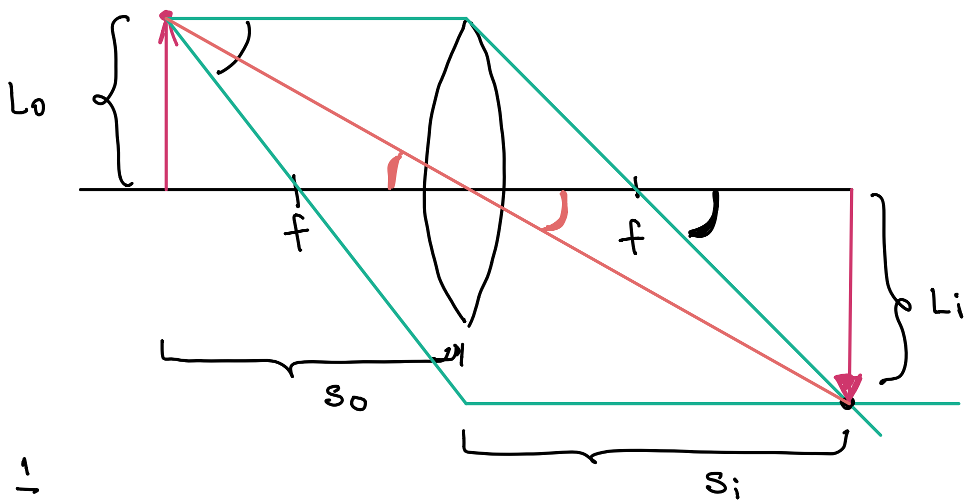
con f tq $\frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$$

• $R_1 > 0$ $\quad R_2 < 0$ $\quad n = \frac{n_2}{n_1} > 1$

$\to \quad f > 0$





$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$$

$\hookrightarrow \quad \frac{L_o}{s_o} = -\frac{L_i}{s_i} \to \frac{L_i}{L_o} = -\frac{s_i}{s_o}$ MAGNIFICACIÓN

• objeto de alto L_o $\quad s_o = 2f$ $\quad L_i = ?$ $\quad s_i = ?$

$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$$

$\hookrightarrow \frac{1}{2f} + \frac{1}{s_i} = \frac{1}{f} \to \frac{1}{s_i} = \frac{1}{f} - \frac{1}{2f} = \frac{1}{2f} \to s_i = 2f = s_o$

$$\frac{L_i}{L_o} = -\frac{s_i}{s_o} \rightarrow \frac{L_i}{L_o} = -1$$

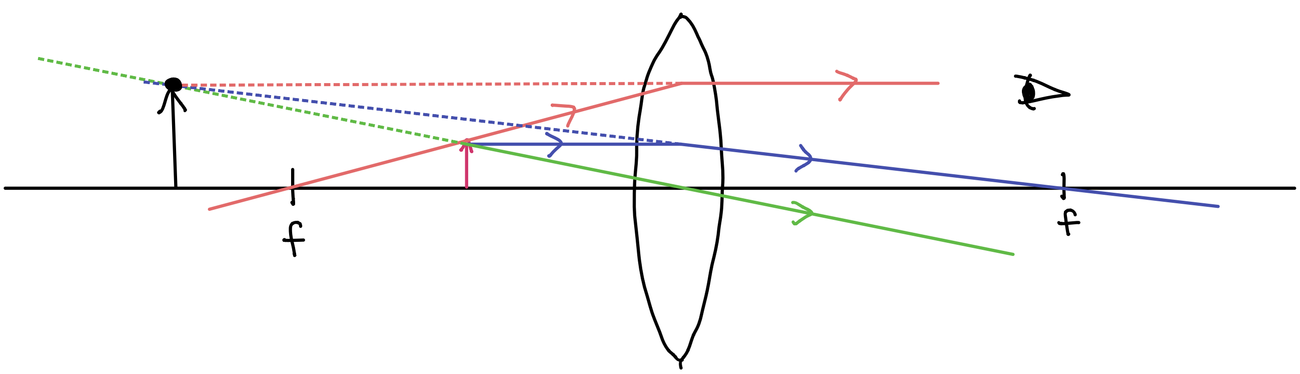
- $s_o = \infty \rightarrow \frac{1}{s_i} = \frac{1}{f}$

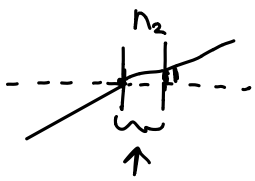
$$\frac{L_i}{L_o} = \cancel{-\frac{s_i}{s_o}} \rightarrow 0$$

- $s_o = f \rightarrow \frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f} \rightarrow \frac{1}{s_i} = 0 \rightarrow s_i \rightarrow \infty$

- $s_o < f$

$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f} \qquad s_i < 0 \qquad \underbrace{|s_i| > f}$$





$$\frac{L_i}{L_o} = \overbrace{-\frac{s_i}{s_o}}^{>0} = \qquad \frac{L_i}{L_o} > 0 \rightarrow \frac{-s_i}{s_o} > 1$$

$$\Rightarrow \frac{L_i}{L_o} > 1 \rightarrow L_i > L_o$$