Final Exam Equation Sheet

Snell's Law $n \sin\theta_{inc} = n' \sin\theta_{trans}$

Gaussian thin lens equation $\frac{1}{t'} = \frac{1}{t} + \phi \qquad M = \frac{y'}{y} = \frac{t'}{t}$

Newtonian thin lens equation $z = \frac{f}{M} \quad z' = -fM \quad zz' = -f^2$

Paraxial power of refractive surface $\phi = (n' - n)\frac{1}{R}$

Type equation here.

Paraxial power of reflective surface $\phi = -\frac{2n}{R}$

yu tracing $n'_k u'_k = n_k u_k - y_k \phi_k \qquad y_{k+1} = y_k + u'_k \, d'_k$

ABCD matrices

$$\begin{bmatrix} y_k \\ u'_k \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -\phi_k & 1 \end{bmatrix} \begin{bmatrix} y_k \\ u_k \end{bmatrix} \equiv \mathcal{R}_k \begin{bmatrix} y_k \\ u_k \end{bmatrix}$$

$$\begin{bmatrix} y_{k+1} \\ u_{k+1} \end{bmatrix} = \begin{bmatrix} 1 & d'_k \\ 0 & 1 \end{bmatrix} \begin{bmatrix} y_k \\ u'_k \end{bmatrix} \equiv \mathrm{T}_k \begin{bmatrix} y_k \\ u'_k \end{bmatrix}$$

Power of two surfaces

$$\Phi = \phi_1 + \phi_2 - \frac{d}{n}\phi_1 \phi_2$$

$$= \frac{1}{R_1}(n-1) + \frac{1}{R_2}(1-n) + \frac{d}{n}\frac{1}{R_1 R_2}(n-1)^2$$

$$= c_1(n-1) + c_2(1-n) + \frac{d}{n}c_1 c_2 (n-1)^2$$