A3SPHTINS **Spherical aberration of a thin lens.**
Calculation of focal length f and f"(corrected)
and longitudinal Spherical Aberration.
All length in cm.

Input data $n \equiv 1.5$ $r1 \equiv 20$ $r2 \equiv -20$ $xo \equiv -40$ $ro \equiv 2$

1. Calculation of f and xi

$$f := \frac{1}{(n-1)\cdot\left(\frac{1}{r1} - \frac{1}{r2}\right)} \qquad f = 20$$

Calculation of xi

$$xi := \frac{1}{\left(\frac{1}{f}\right) + \frac{1}{xo}} \qquad xi = 40$$

2. Calculation of ff, shape and position factor and xi

$$a(xo) := \left[\left(\frac{1}{r1} - \frac{1}{xo}\right)^2 \cdot \left(\frac{1}{r1} - \frac{n+1}{xo}\right)\right] \qquad b(xo) := \left(\frac{1}{xo} + \frac{n-1}{r1} - \frac{n}{r2}\right)^2$$

$$c(xo) := \left[\frac{n^2}{r2} - \frac{n+1}{xo} - \frac{\left(n^2-1\right)}{r1}\right]$$

$$ff(xo) := \frac{1}{\left[\frac{1}{f} + \frac{n-1}{n^2}\cdot\left(\frac{ro^2}{2}\right)\cdot(a(xo) - b(xo)\cdot c(xo))\right]}$$

$$ff(xo) = 19.778$$

Image distance for no Sph Abb

$$xi1(xo) := \frac{1}{\left(\frac{1}{xo} + \frac{1}{f}\right)}$$

$$xi1(xo) = 40$$

Image distance for Sph Abb

$$xiisph(xo) := \frac{1}{\left(\frac{1}{xo} + \frac{1}{ff(xo)}\right)}$$

$$xiisph(xo) = 39.12$$

3. Calculation of LSA

$$LSAxi(xo) := xi1(xo) - xiisph(xo)$$

$$LSAxi(xo) = 0.88$$

4. Calculation of lateral spherical aberration LAT

$$\rho := 4$$

$$LAT := LSAxi(xo) \cdot \frac{\rho}{xiisph(xo)}$$

$$LAT = 0.09$$