A8ASTISMS **Astigmatism of a thin lens**.

We have for the horizontal and vertical direction each an imaging equation which looks like the imaging equation for the thin lens, but the expressions depend on angles.

We have for horizontal -1/xo +1/xih = (cosϕ)(cosϕ'/cosϕ - 1)(1/r1-1/r2)
and for vertical -1/xo +1/xiv = (1/cosϕ)(cosϕ'/cosϕ - 1)(1/r1-1/r2)

using the law of refraction we can replace ϕ' by ϕ and make a plot of the difference xih-xiv as function of ϕ.

1. Graph of ASD for fixed n and dependence on ϕ

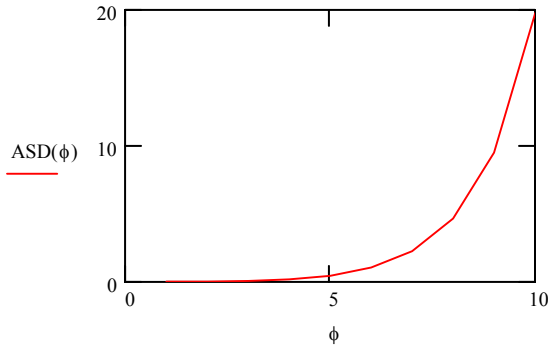
$\phi := 1, 2 .. 10$ $xoo := -400$ $r1 := 10$ $r2 := -12$ $n := 1.3$

$$c(\phi) := \sqrt{1 - \frac{\sin\left(2\cdot\pi\cdot\frac{\phi}{360}\right)^2}{n^2}}$$

$$xih(\phi) := \frac{1}{\left[\left(\cos\left(2\cdot\pi\cdot\frac{\phi}{360}\right)\right)\cdot\left(\frac{c(\phi)}{\cos\left(2\cdot\pi\cdot\frac{\phi}{360}\right)} - 1\right)\cdot\left(\frac{1}{r1} - \frac{1}{r2}\right)\right] + \frac{1}{xoo}}$$

$$xiv(\phi) := \frac{1}{\left[\left(\frac{1}{\cos\left(2\cdot\pi\cdot\frac{\phi}{360}\right)}\right)\cdot\left(\frac{c(\phi)}{\cos\left(2\cdot\pi\cdot\frac{\phi}{360}\right)} - 1\right)\cdot\left(\frac{1}{r1} - \frac{1}{r2}\right)\right] + \frac{1}{xoo}}$$

$$ASD(\phi) := xih(\phi) - xiv(\phi)$$



2. Graph of ASD for fixed ϕ and dependence on n

$\phi \equiv 5$ $\quad xoo := -400$ $\quad r1 := 10$ $\quad r2 := -12$ $\quad n := 1.3, 1.301 .. 3$

$$c(n) := \sqrt{1 - \frac{\sin\left(2 \cdot \pi \cdot \frac{\phi}{360}\right)^2}{n^2}}$$

$$xih(n) := \frac{1}{\left[\left[\left(\cos\left(2 \cdot \pi \cdot \frac{\phi}{360}\right)\right) \cdot \left(\frac{c(n)}{\cos\left(2 \cdot \pi \cdot \frac{\phi}{360}\right)} - 1\right) \cdot \left(\frac{1}{r1} - \frac{1}{r2}\right)\right] + \frac{1}{xoo}\right]}$$

$$xiv(n) := \frac{1}{\left[\left[\frac{1}{\cos\left(2 \cdot \pi \cdot \frac{\phi}{360}\right)} \cdot \left(\frac{c(n)}{\cos\left(2 \cdot \pi \cdot \frac{\phi}{360}\right)} - 1\right) \cdot \left(\frac{1}{r1} - \frac{1}{r2}\right)\right] + \frac{1}{xoo}\right]}$$

$ASD(n) := xih(n) - xiv(n)$