In OPT242, we learned how to use conjugate factor to calculate the third order aberrations. It turns out that the conjugate factor of a two thin lens layout is only related with the curvature of the lens, index of the lens, and the chief ray angle of the lens. This led to the idea that whether we can use the third oder coma, third order spherical aberrations to calulcate asphere equavalent two thin lens curvature generate by Phantom Asphere.

A screen shot of a graph

Description automatically generated

*Assume all airspace has index of 1!!!*

*From [2]:*

*Assume for thin lens,*

*Fraction between , :*

*Subsitute this equation into [1]*

*While Y1 != 1:*

*Do similar things to get Y2*

*From [5]:*

*Take [6] into [4]*

*Use n=1.5*

*Simple Case: we only have third order asphere coefficient d with no conic.*

*Spherical aberration:*

*Currently lake other information, thus, assume one of the lens is the same as the original lens without asphere.*

*n=1.5:*

*Need one more coefficient to calculate both C1 and C2*

*Coma:*

*A math equations and formulas

Description automatically generated with medium confidence*

*[Reference:* [*https://wp.optics.arizona.edu/jsasian/wp-content/uploads/sites/33/2016/03/L11\_OPTI517\_Coma\_Aberration.pdf*](https://wp.optics.arizona.edu/jsasian/wp-content/uploads/sites/33/2016/03/L11_OPTI517_Coma_Aberration.pdf)*]*

*A group of math equations

Description automatically generated*

*Astigmatism*

*Petzval:*

*We want to calculate C1, C2, C3, C4 from these four aberrations.*