

c : speed of light vacuum

2-1

v : " " " medium

n : refractive index

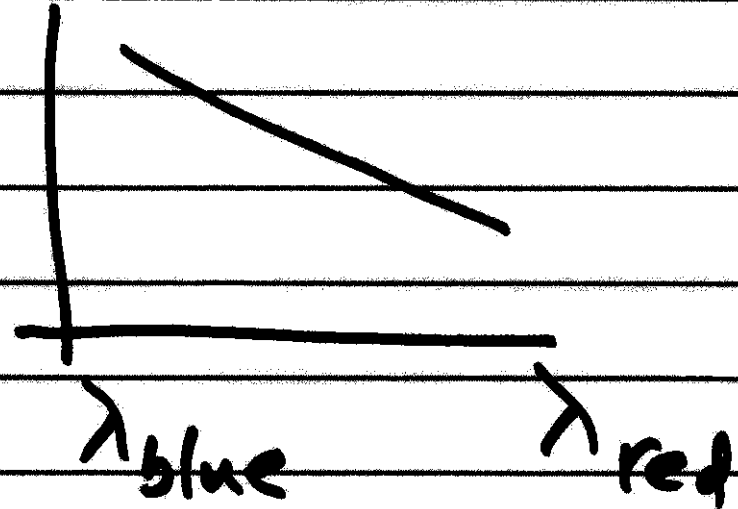
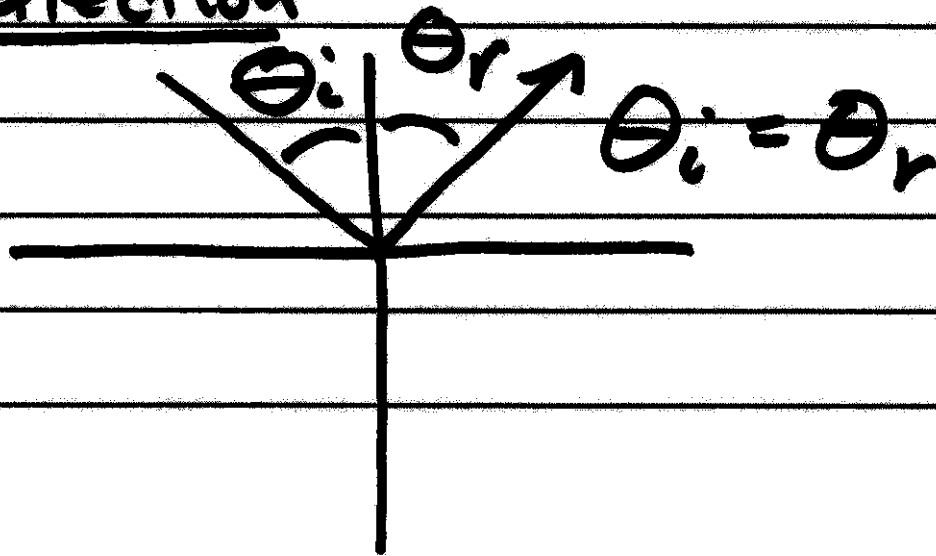
$$n = c/v$$

$$v < c$$

$$n > 1.00$$

$$n = n(\lambda), n(\nu)$$

reflection



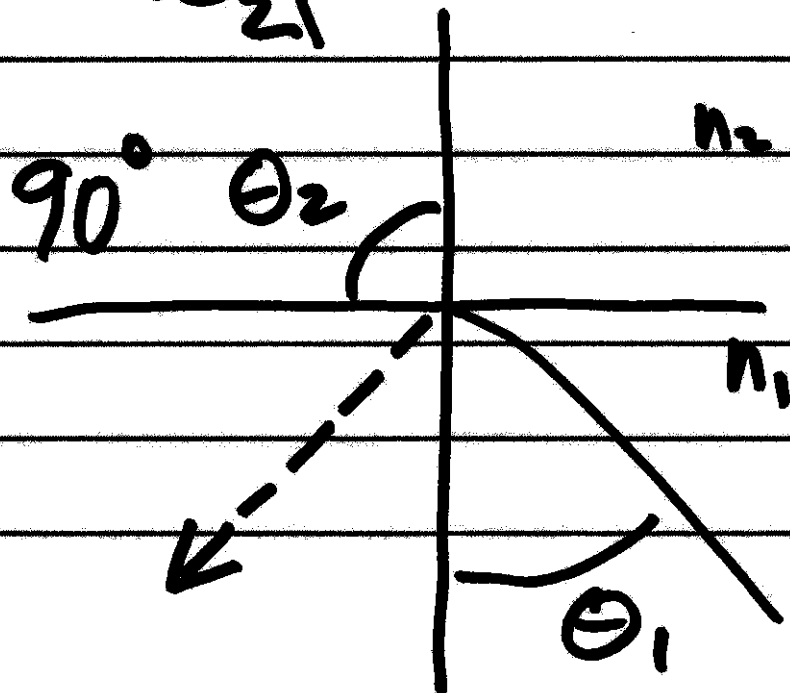
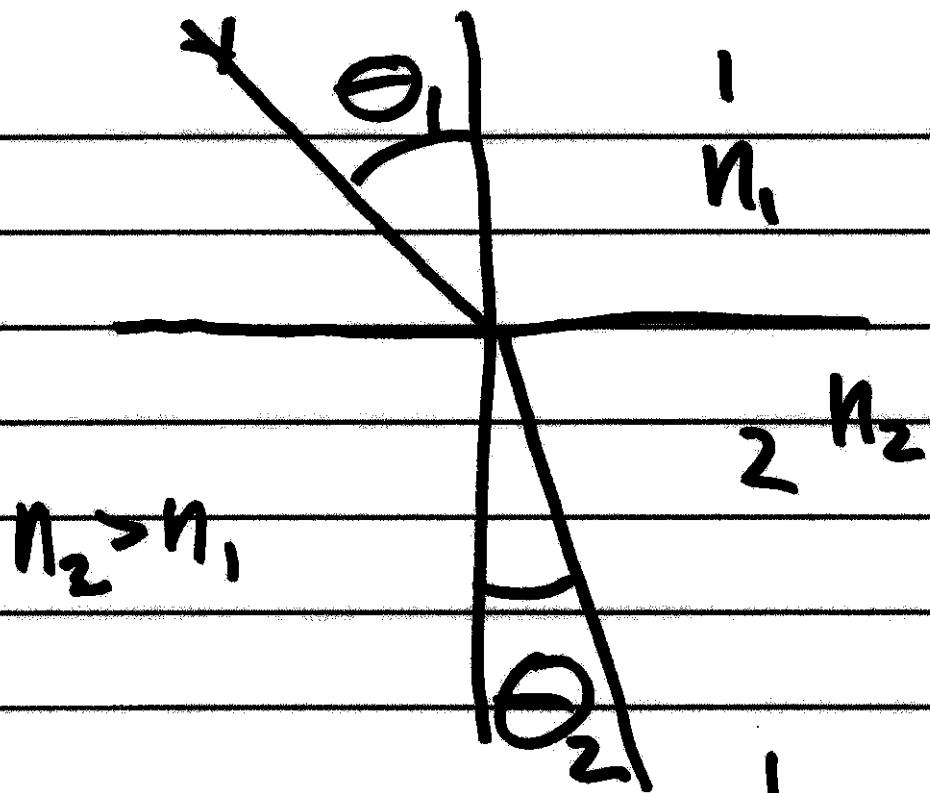
Snell's Law 2-2

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

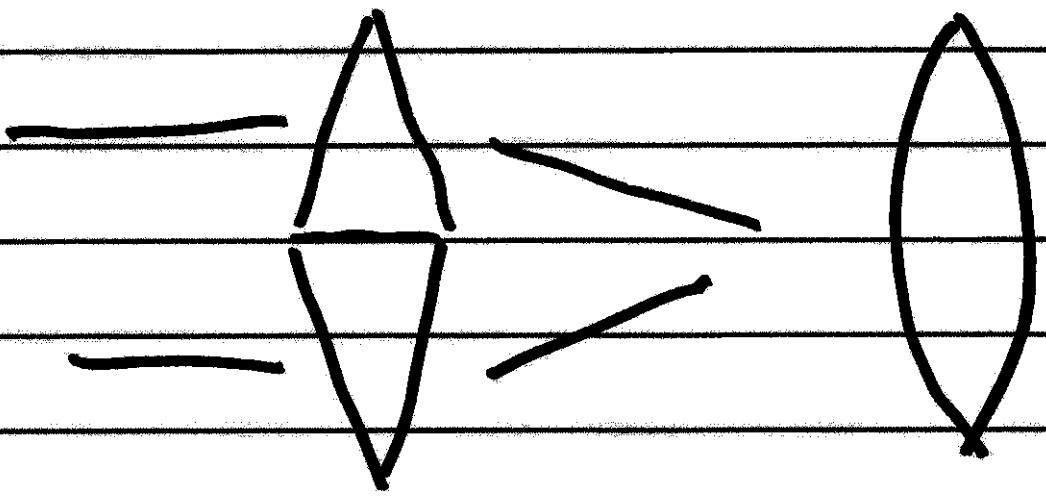
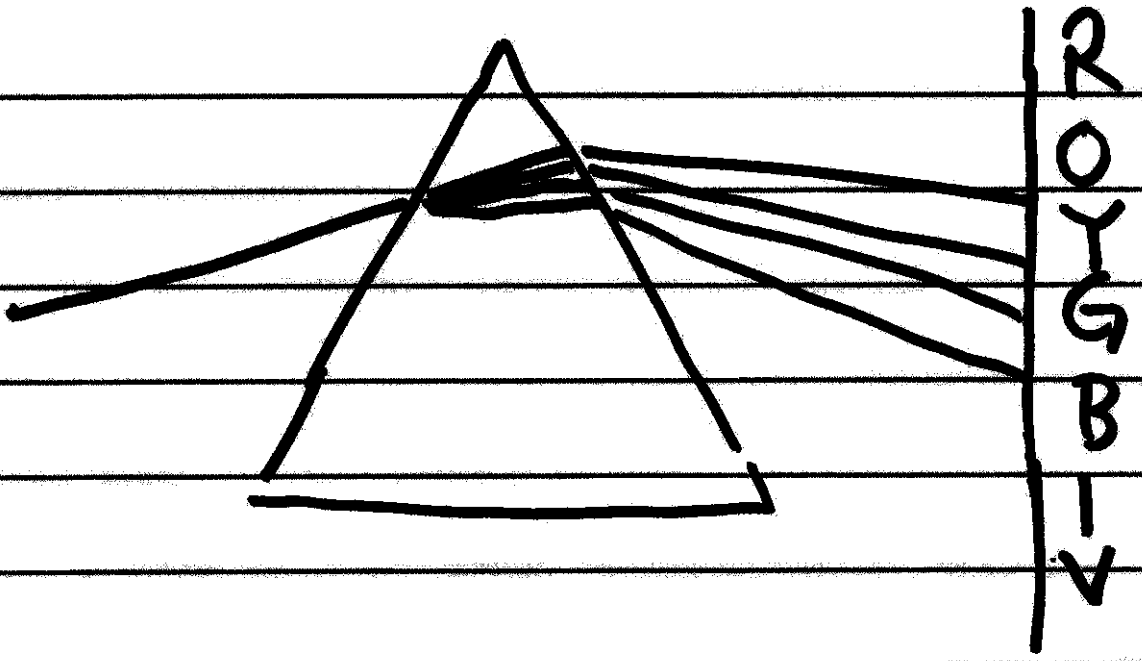
$$n_1 \sin \theta_1 = n_2 (1)$$

$$\sin \theta_c = \frac{n_2}{n_1}$$

critical angle

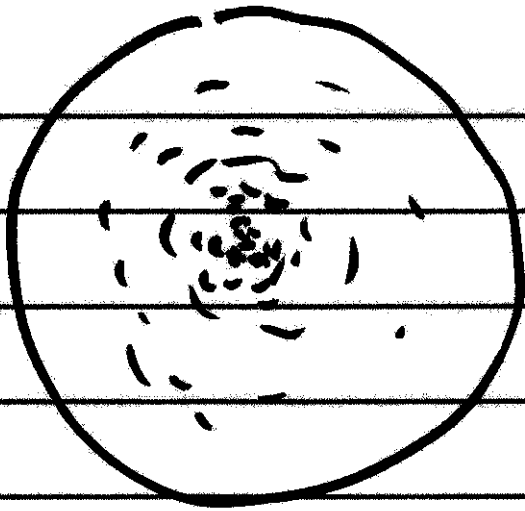


2-3



anti-vignetting filter²⁻⁴

Aberrations



1. Spherical Aberration

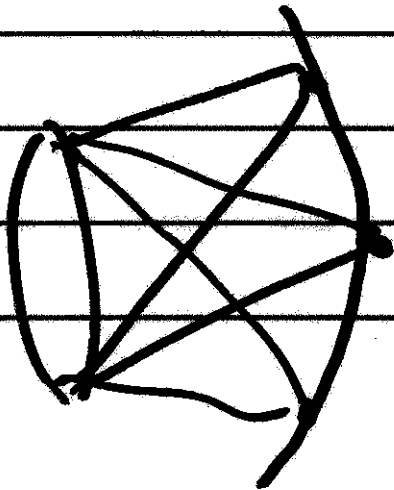
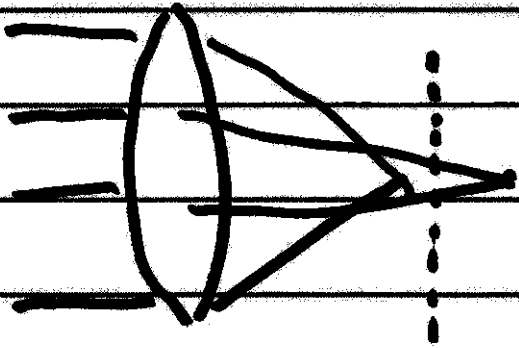
2. coma

3. astigmatism

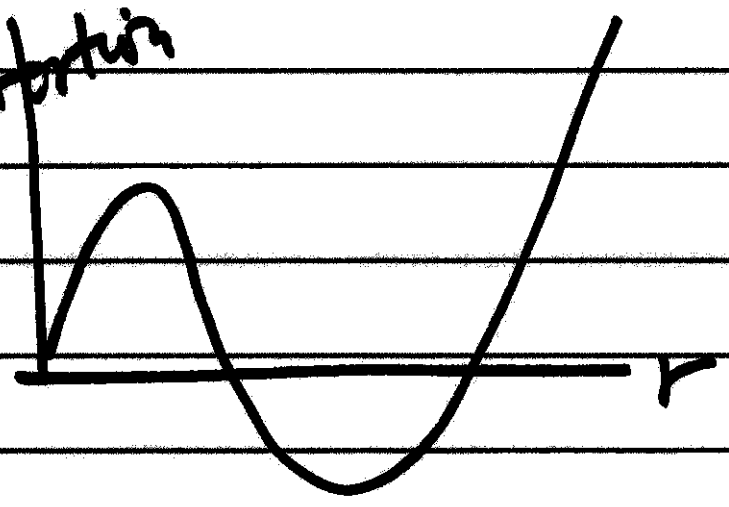
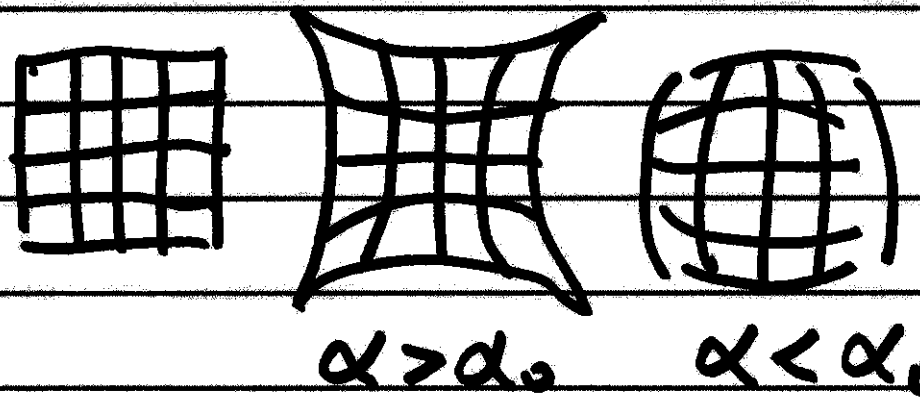
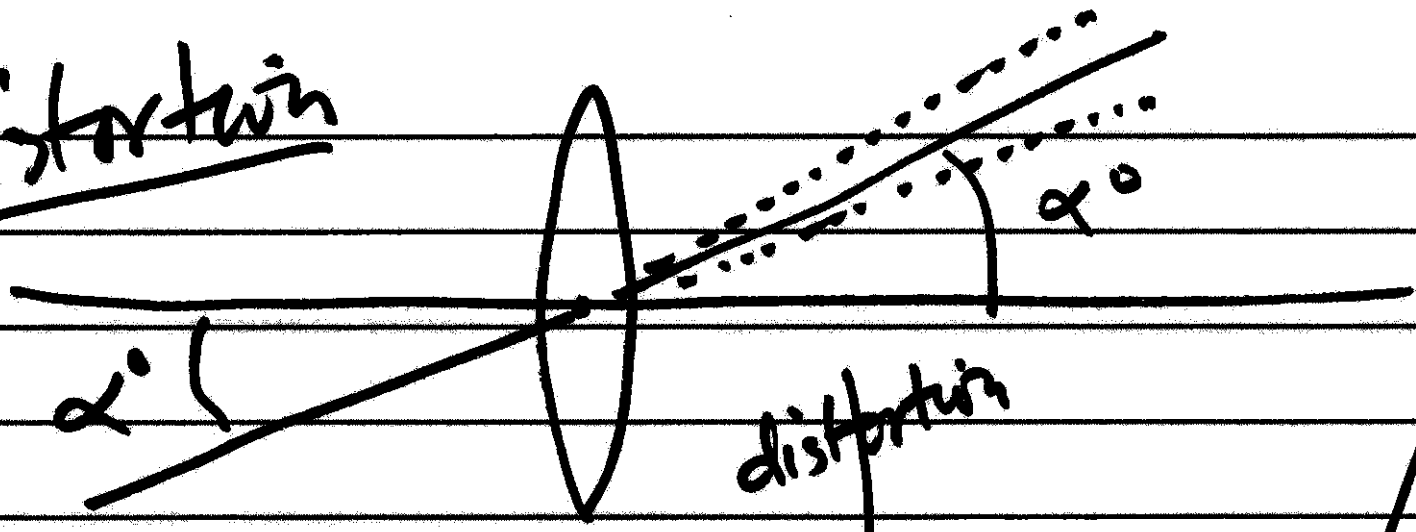
4. field curvature

5. Distortion

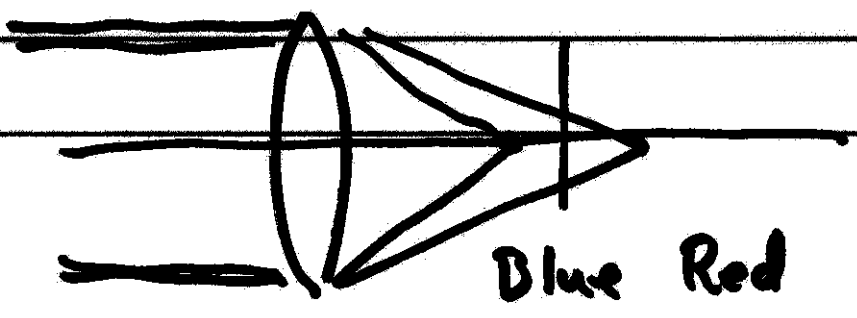
} off axis points



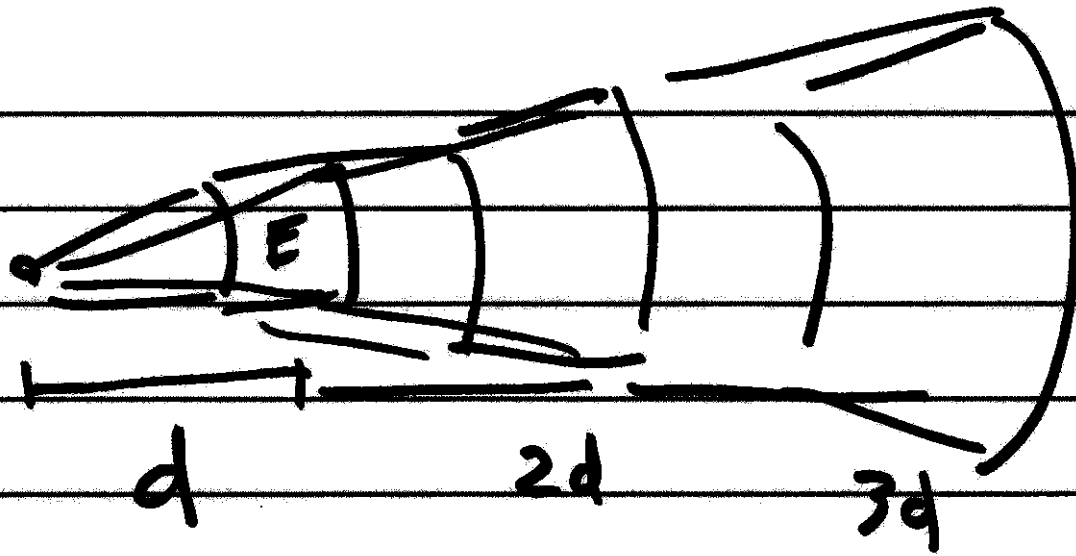
distortion



Chromatic aberration

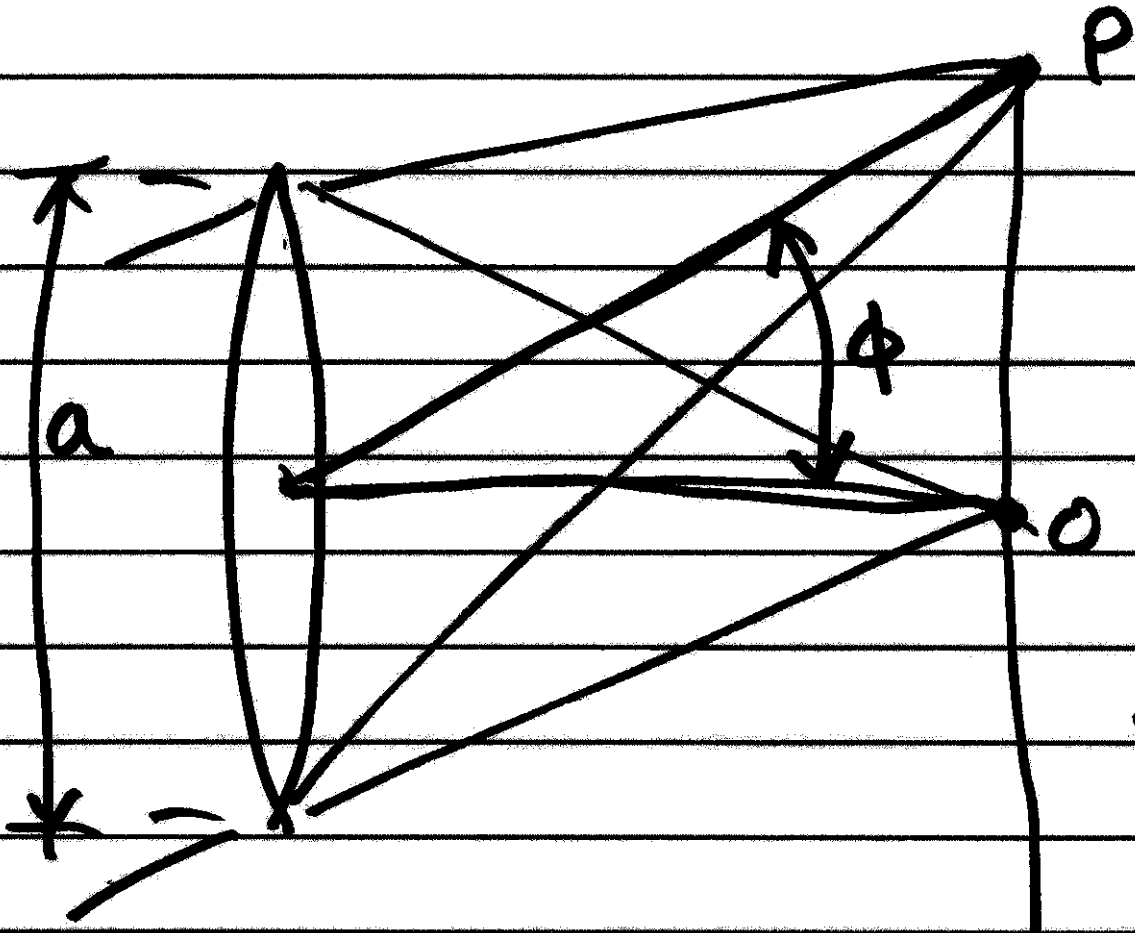


2-6



irradiance decrease as square of distance
watts/m² from source

3 reasons 2-7



1. circular aperture at O , elliptical at P : $\cos \phi$
2. obliquity of beam at P : $\cos \phi$
3. $\cos^2 \phi$: difference in distance

$$E_{\phi} = E_0 \cdot \cos^4 \phi$$