

c : speed of light vacuum
 v : speed of light in medium
 n : refractive index

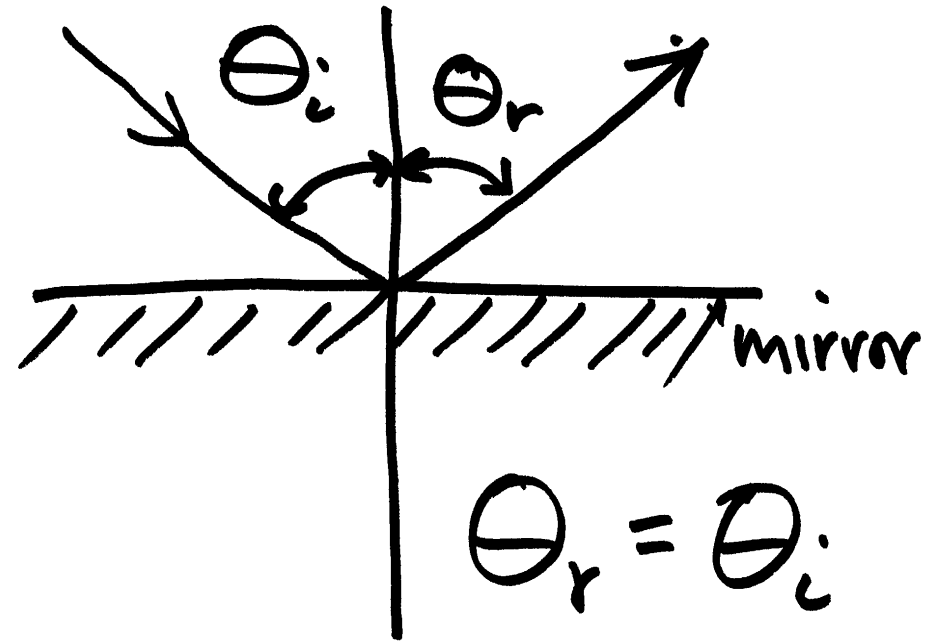
$$n = c/v, \quad v < c$$

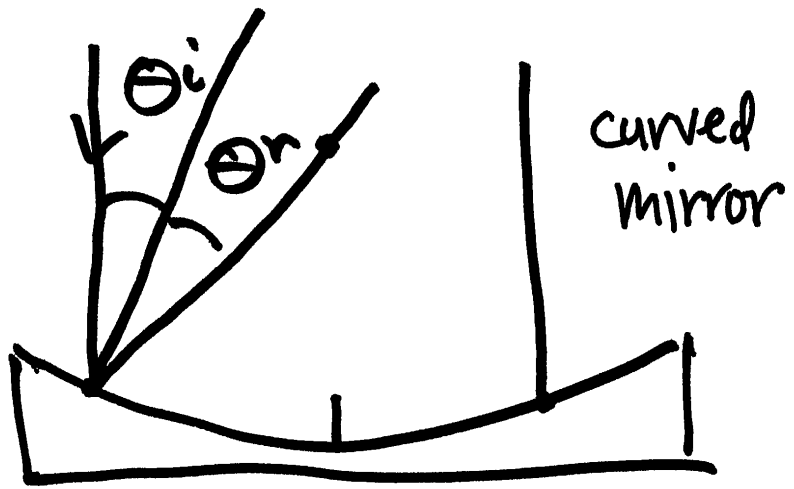
$$n > 1.00$$



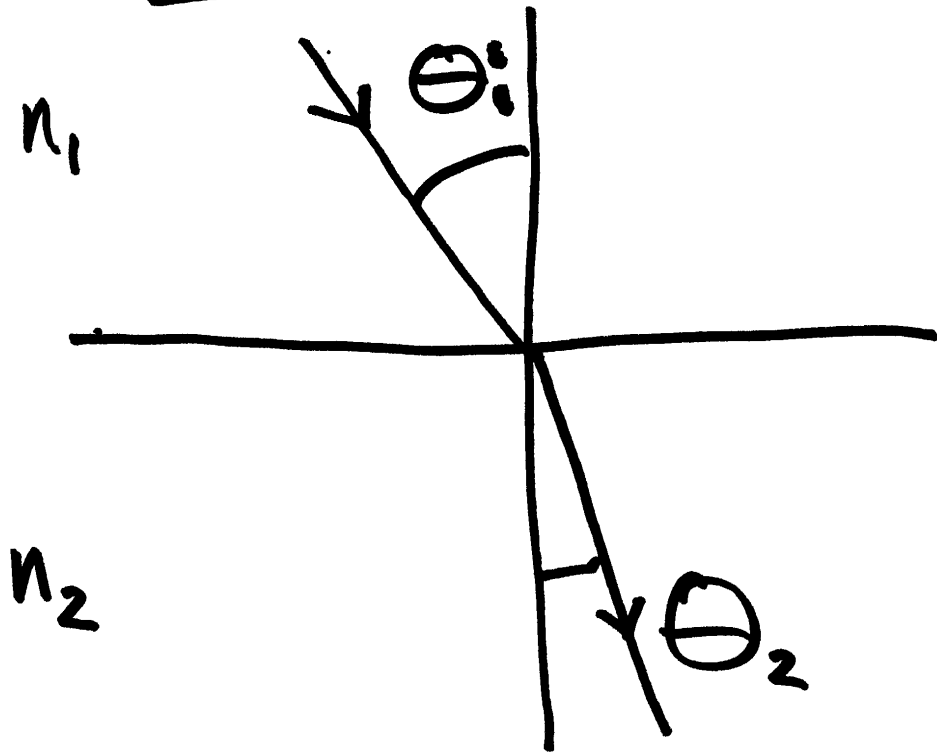
Reflection

2-1

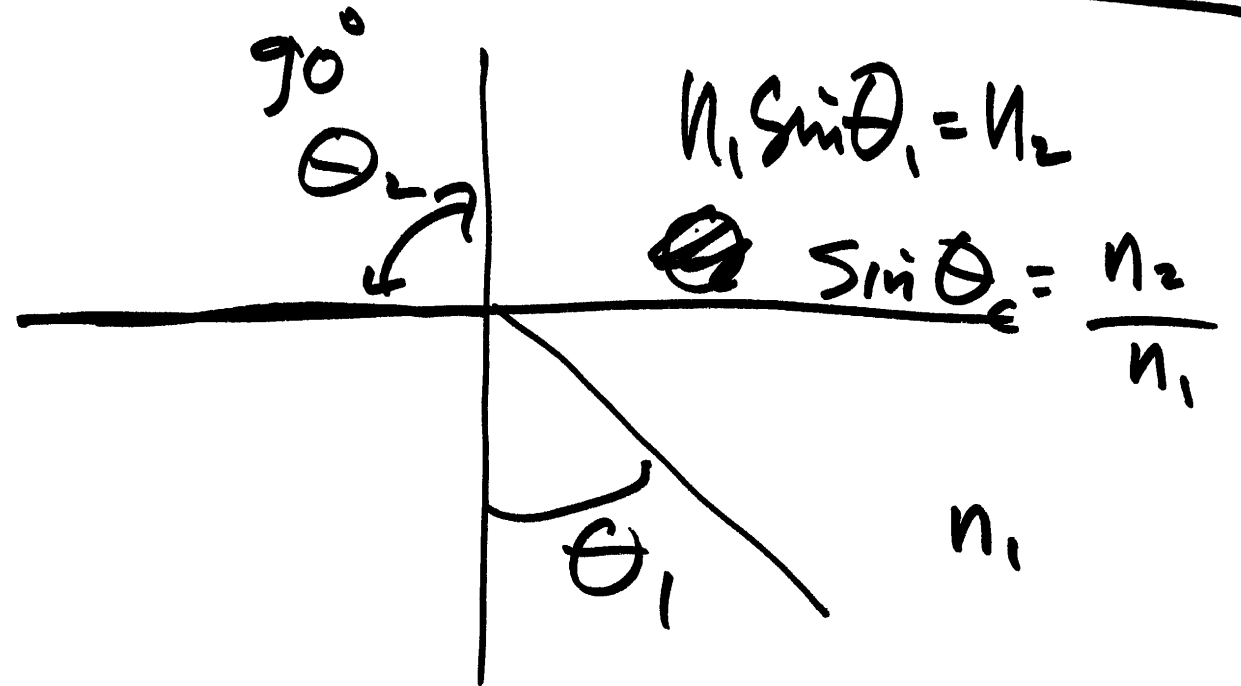


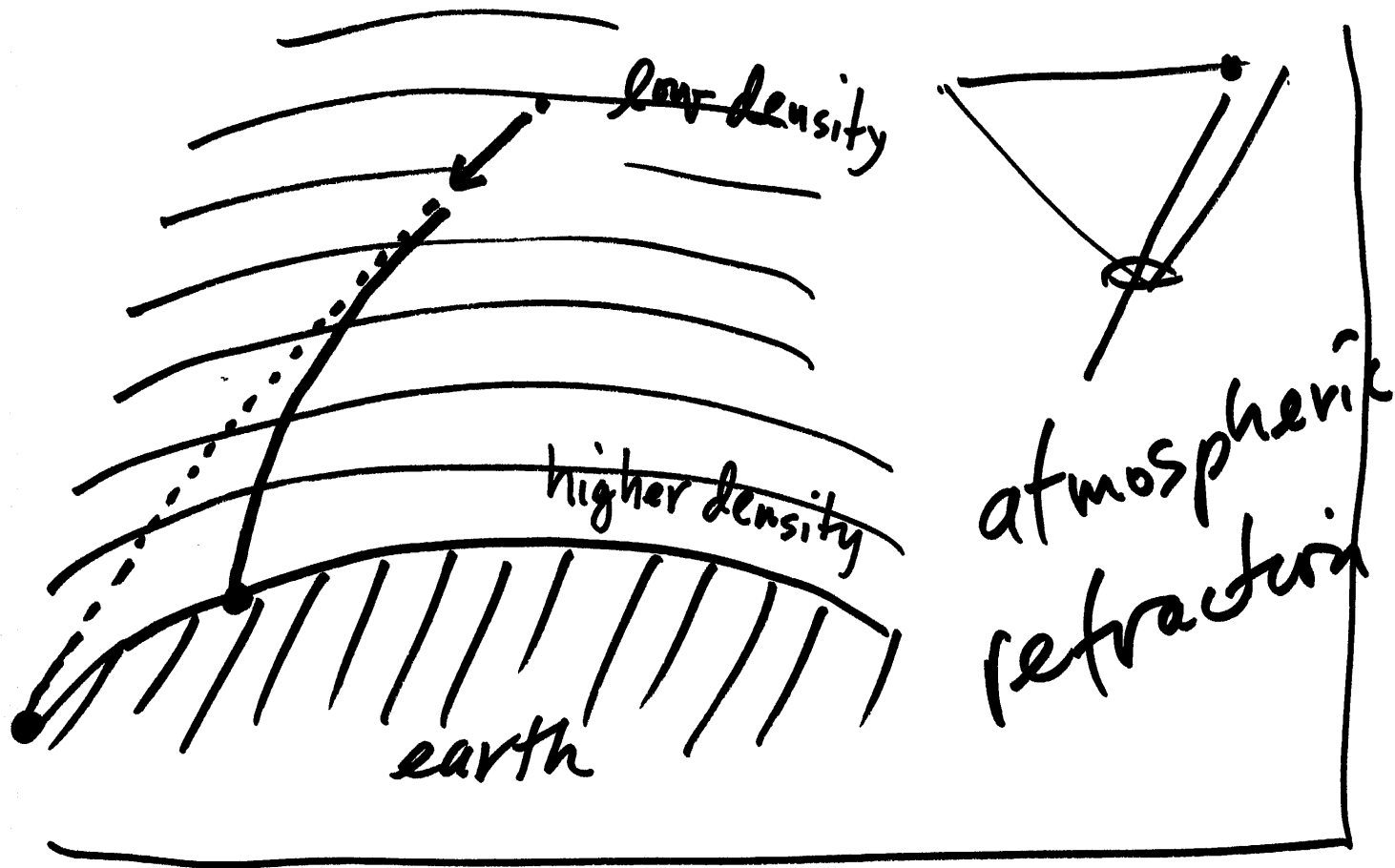


Refraction

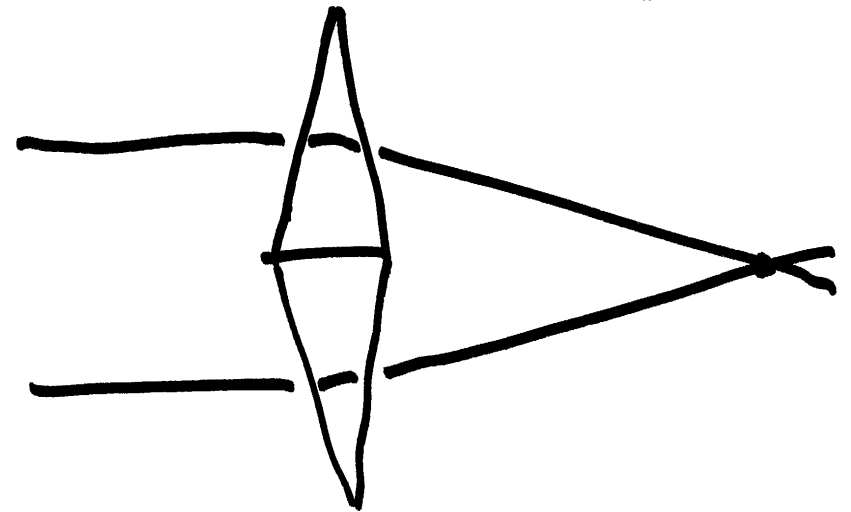
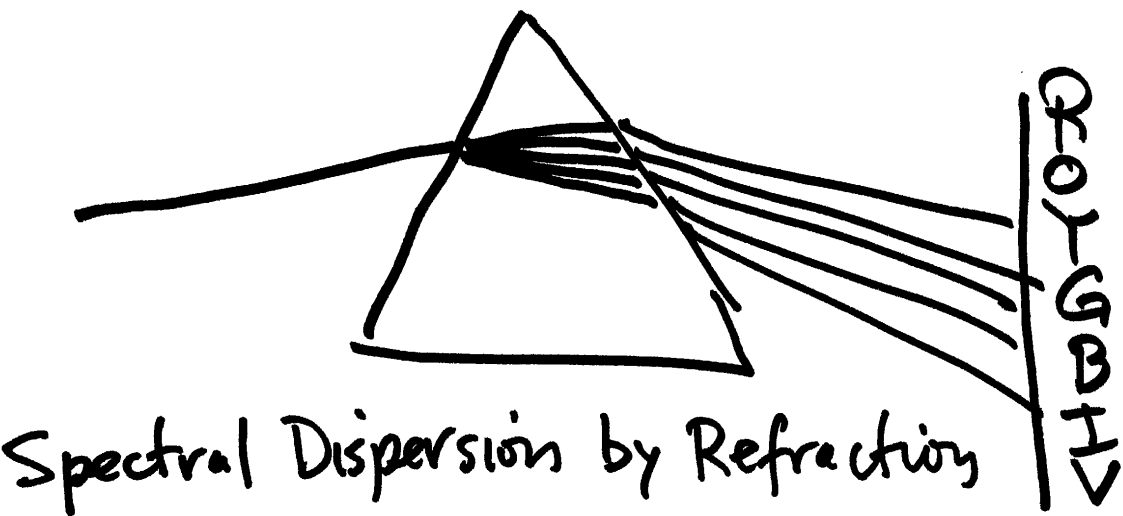


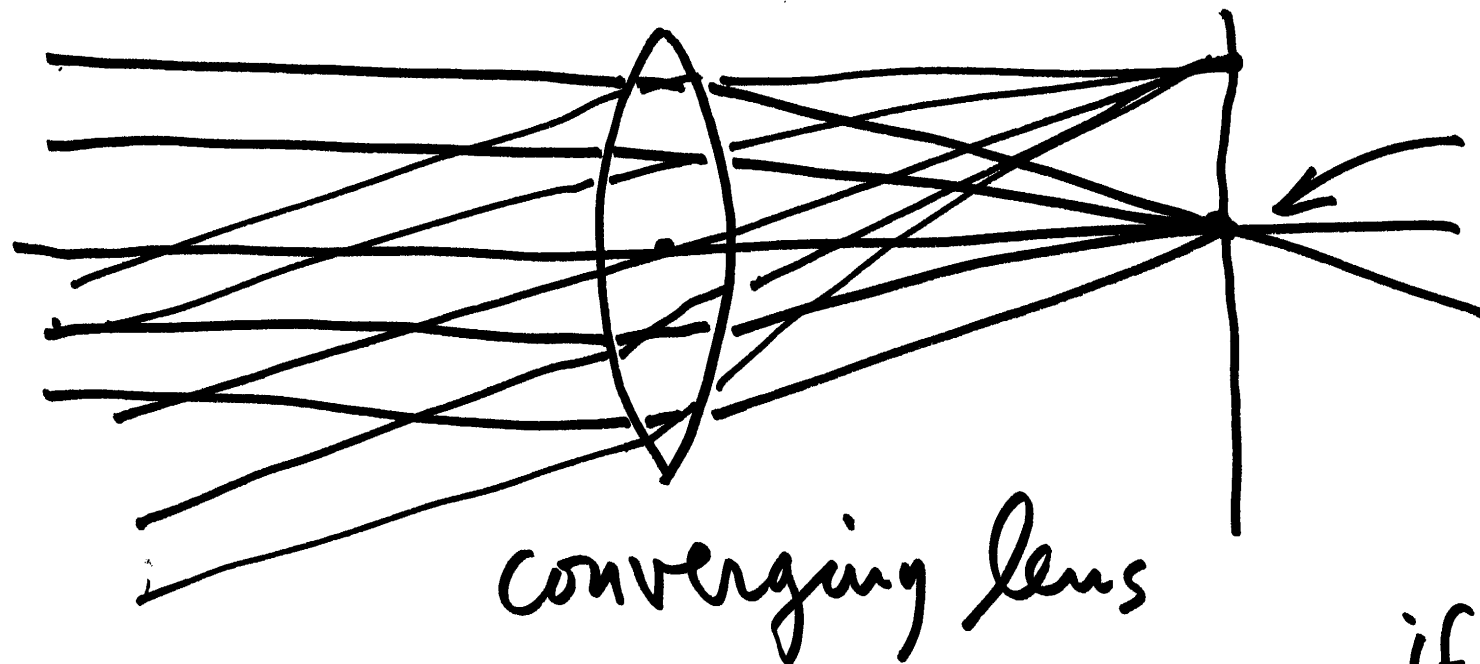
Snell's Law:
$$\frac{n_1 \sin \theta_1 = n_2 \sin \theta_2}{2-2}$$





2-3
 glass prism
 diffraction grating

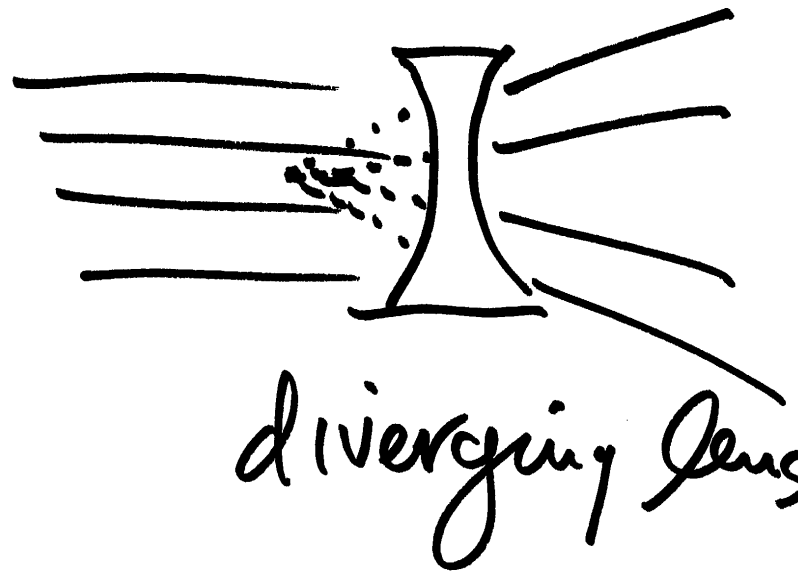




converging lens

•
not
a
point

⊗
blur
circle

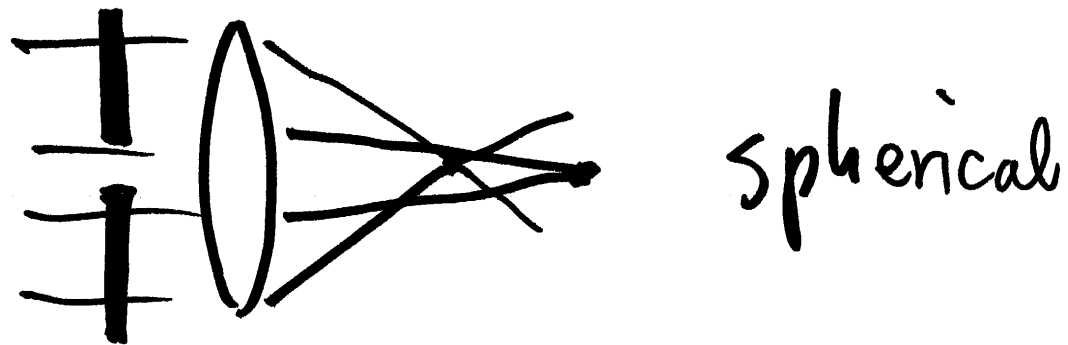


diverging lens

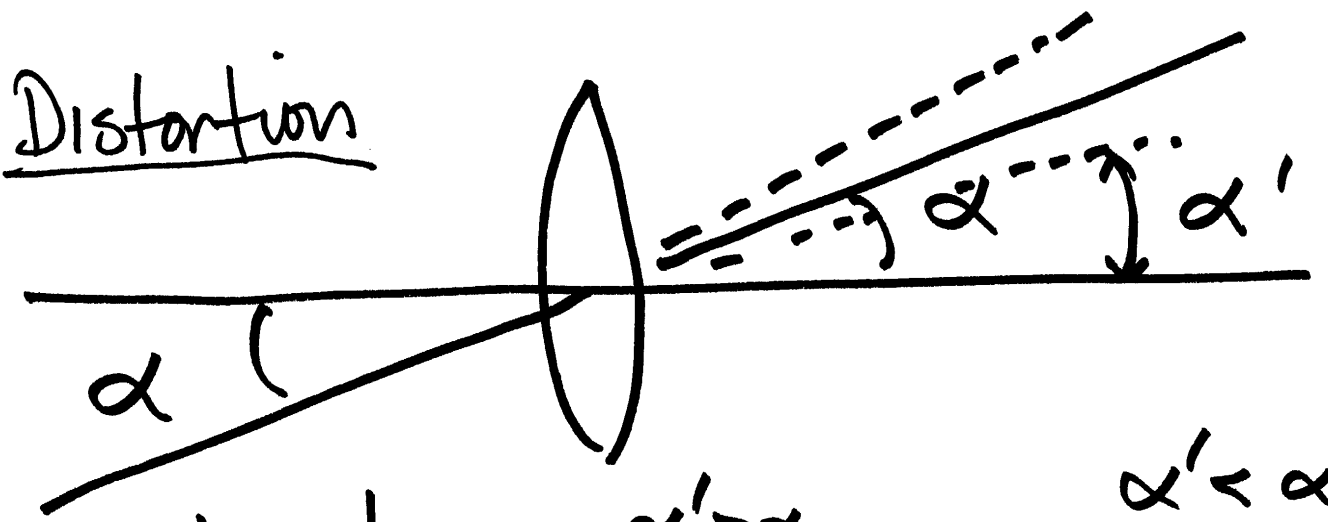
if spherical surfaces
⇒ Aberrations

Seidel Aberrations

1. spherical
2. coma
3. astigmatism
4. field curvature
5. distortion

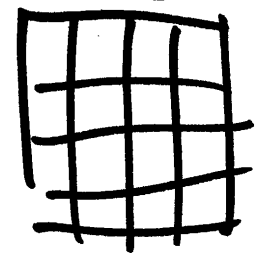


Distortion

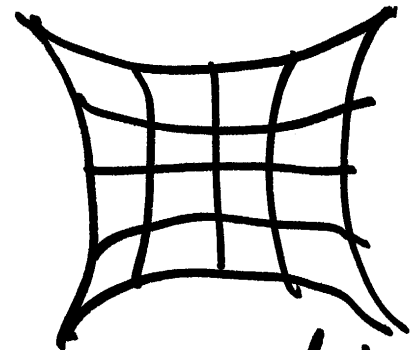


ideally $\alpha' = \alpha$

target

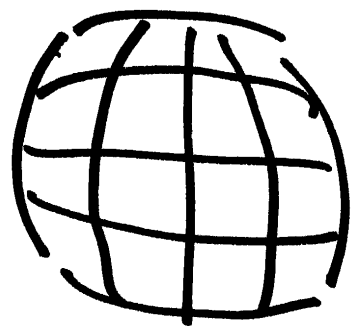


$\alpha' > \alpha$

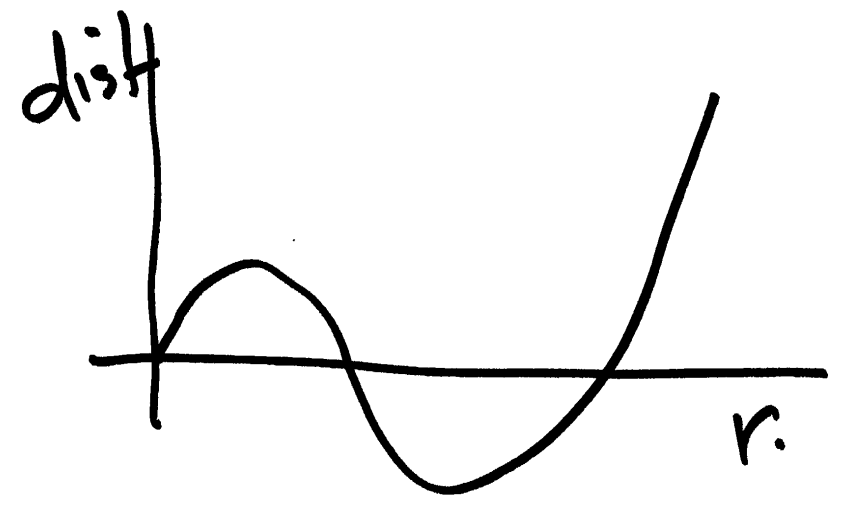


pin cushion

$\alpha' < \alpha$



barrel



Chromatic aberration //