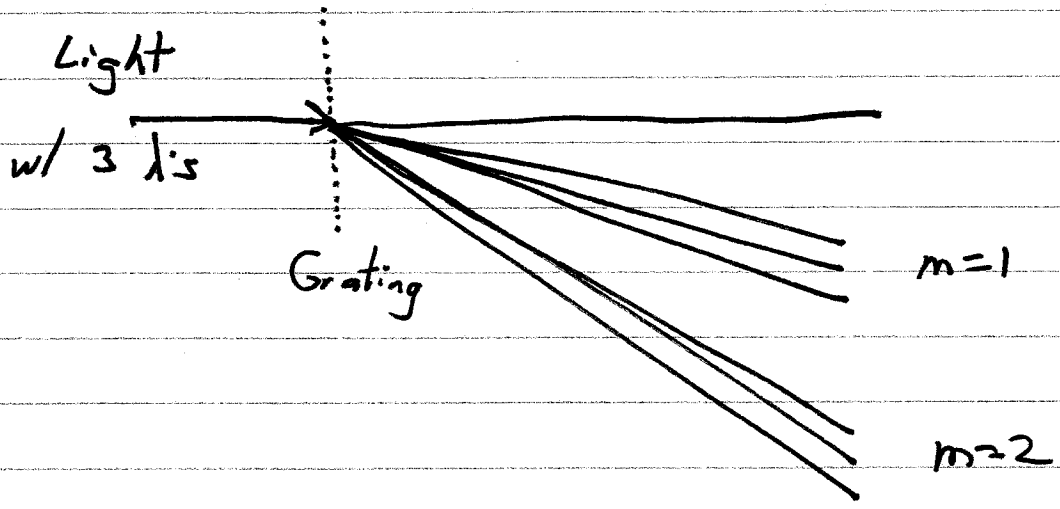
Phys 1402 2014-11-25

Hw6 #2 : Diffraction Grating

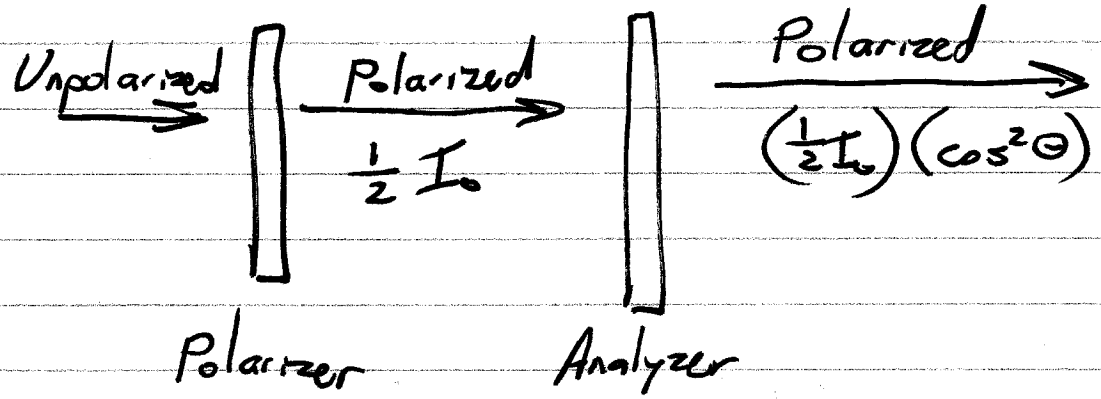
$m\lambda = d\sin\theta$ $\tan\theta = \frac{y}{L}$



#3 Polarization

Unpolarized $\rightarrow$ $I_{out} = \frac{1}{2} I_{in}$ $\rightarrow$ Polarized

Polarized $\rightarrow$ $I_{out} = I_{in}\cos^2\theta$ $\rightarrow$ Polarized



#5 Physical Properties of Light

$v = f\lambda$ $\qquad$ $E = hf$

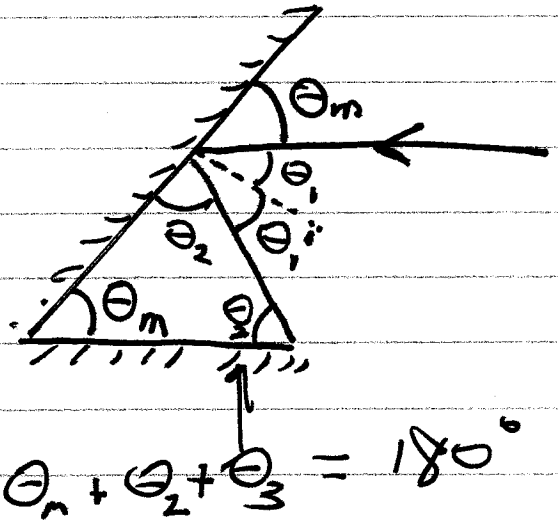
h = Planck's constant

E = photon energy

(Careful: $\hbar = \frac{h}{2\pi}$ so $E = \hbar\omega$)

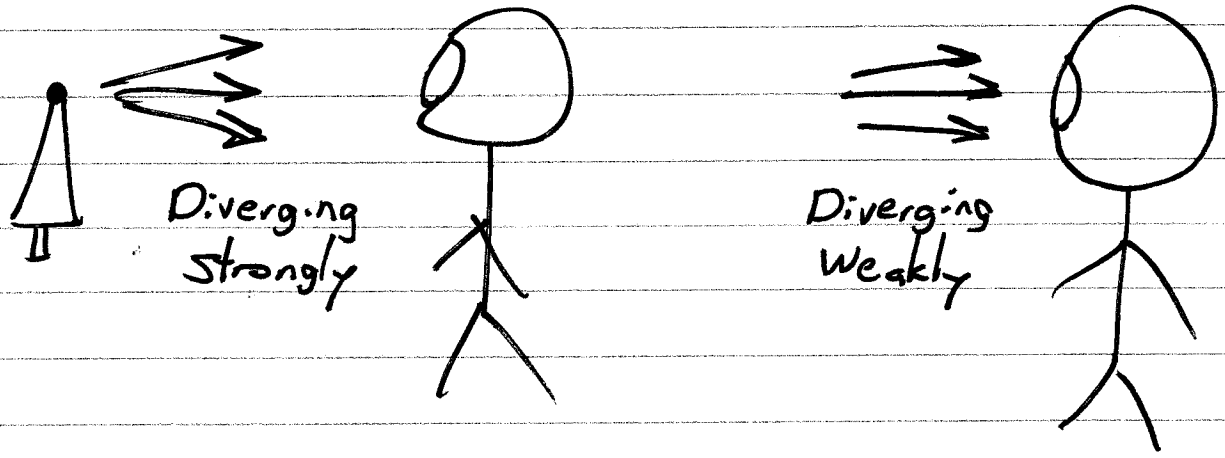
Note: f stays constant as n changes.

#6 Reflection $\qquad \theta_1 = \theta_1'$



$\theta_m + \theta_2 + \theta_3 = 180^\circ$

Vision & Image Formation



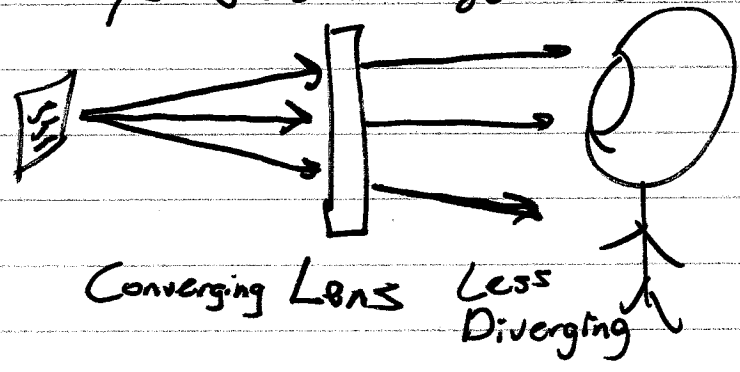
Typically, a person has a nearest distance they can focus on. $d_{np} \approx 25$ cm

What if a person's near point is too far?

- The need is for a far object.
- The need is for <u>weakly div.</u> rays.

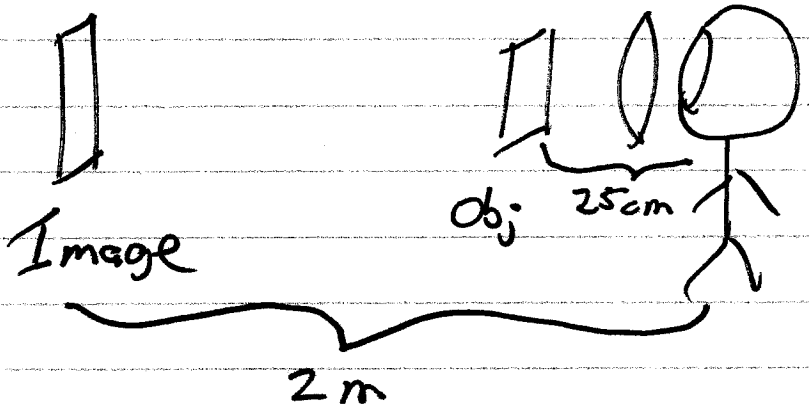
- A book is too close to me.
- The rays from the book are <u>too divergent</u>.

- To correct, I use a lens to nudge the rays back together.



Ex: $d_{np} = 2.0\ m$

$x = 25\ cm$



$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$\frac{1}{25} + \frac{1}{-200} = \frac{1}{f} \qquad \text{(in cm)}$$

Image dist. is always negative for corrective lenses.

$f = 28.6\ cm$

Angular Size (Fig 25.5)

$$\tan\theta_o \approx \theta_o \approx \frac{h}{d_{np}}$$

↑ in radians

Best w/o magnification

Magnifier – converging lens w/ object just inside f.

Image is virtual & "very far".

$$\tan\theta = \theta = \frac{h}{f} \quad \text{w/ magnifier}$$

$$m = \frac{\theta}{\theta_o} = \frac{d_{np}}{f}$$

Multi-Lens

	Microscope	Telescope
Objective	Converging	Converging
Object	Just outside f_o	Far Away
Mode	Projector	Projector
Image Dist	L	f_o
	$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$	$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$
	small ~ 1/f	Tiny
	Tiny	

Both Devices: Eyepiece is a converging lens
Eyepiece is a "magnifier".

Magnification:

$$m = \frac{L\, d_{np}}{f_o f_e}$$

Fig 25.7

$$m = \frac{f_o}{f_e}$$

Fig 25.8