Reminders 4-17-08:
-Conceptual Questions on Wave Optics will be posted.
-Read Chapter 24 and 25
-Exam 4 Thursday April 24 Chapters 22-25

Reminders 3-27-08:
-Chapter 20 homework due Tonight
-Exam 3 April 1
-Read 21.8-21.13
-Lens Lab Has Been Changed

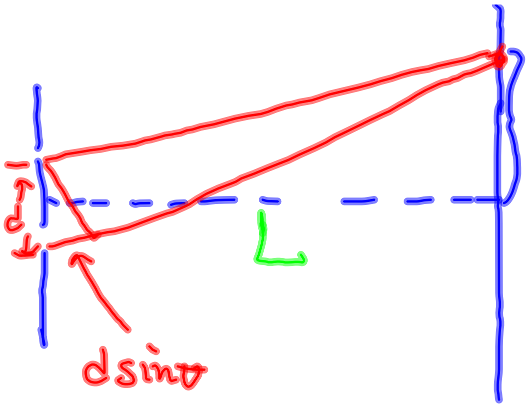
Objectives:
-Interference and Young's Experiment
-Diffraction
-Polarization

Objectives:
-Properties of Electromagnetic Waves
-Electromagnetic Spectrum
-Nature of Light
-Doppler Effect for Light

Wave Optics

- Red light from a He-Ne laser (λ =632.8nm)is incident on two narrow slits separated by 0.200mm. A fringe pattern is observed on a white sheet of paper held 1.00m away How far above and below the central axis do the first dark minima (minimum intensity) occur? Where is the 5th order bright fringe.

Answer: ±1.58mm;15.8mm



$d\sin\theta = (m+\frac{1}{2})\lambda$

want $m=0$

$d\sin\theta = \frac{\lambda}{2}$

$\sin\theta = \frac{\lambda}{2d}$ dest

Constr

$\sin\theta = \frac{m\lambda}{d} = \frac{5\lambda}{d}$

$\sin\theta = \frac{632.8\times10^{-9}m}{2(.0002m)}$

$\theta = .091°$

$y = L\tan\theta = 1m \tan .091°$

$= .00158m$

If θ small $\sin\theta \approx \tan\theta$

$y = L\tan\theta \approx L\sin\theta = L\left(\frac{\lambda}{2d}\right)$

$1\left(\frac{632.8\times10^{-9}}{2(.0002)}\right)$

5th order

$y = 15.8mm$ 10 times previous answer!

Apr 7-12:32 PM

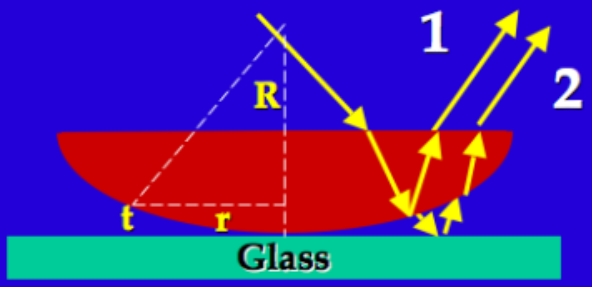
$\sqrt{R^2-(R-t)^2} = \sqrt{2Rt-t^2}$ neglect t^2

Wave Optics

Newton's rings-fringes of equal thickness

Wave 1-No phase change

Wave 2-180° phase change



$2t = m\lambda_n + \lambda_n/2$

$\lambda_n = \lambda/n$

constructive int.

$r^2 = R^2-(R-t)^2$

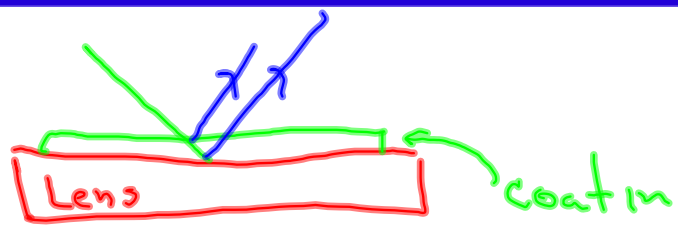
$r \approx (2Rt)^{1/2} = [(m+1/2)\,\lambda_n R]^{1/2}$

Radius of curvature on lens on glass plate is R.

Wave Optics

- A telescope lens with an index of refraction of 1.55 is to be coated with a MgF_2 (n=1.38) to increase the transmission of yellow light (λ =550nm). What is the minimum thickness of the coating? (Hint: the goal is to minimize reflection to maximize transmission)

Answer: 99.6nm



destructive Int.

$2t = (m + \frac{1}{2})\lambda$

for minimum thickness $m = 0$

$2t = \frac{1}{2}$ $\quad t = \frac{\lambda}{4} = \left(\frac{550\text{nm}}{1.38}\right)\frac{1}{4}$

$= 99.6\text{ nm}$

Wave Optics

- A beam of vertically polarized light is incident on 3 polaroid films. The transmission axis of the 1st polarizer is at 0 degrees with respect to the vertical,the 2nd is at 40.0° with respect the the vertical, and the 3rd is at 75.0° with respect to the vertical. What percent of the incident light is transmitted through all three polaroids?

Answer: $I=0.39I_o$;39%; 19.5% if incident light is unpolarized

Apr 7-12:32 PM