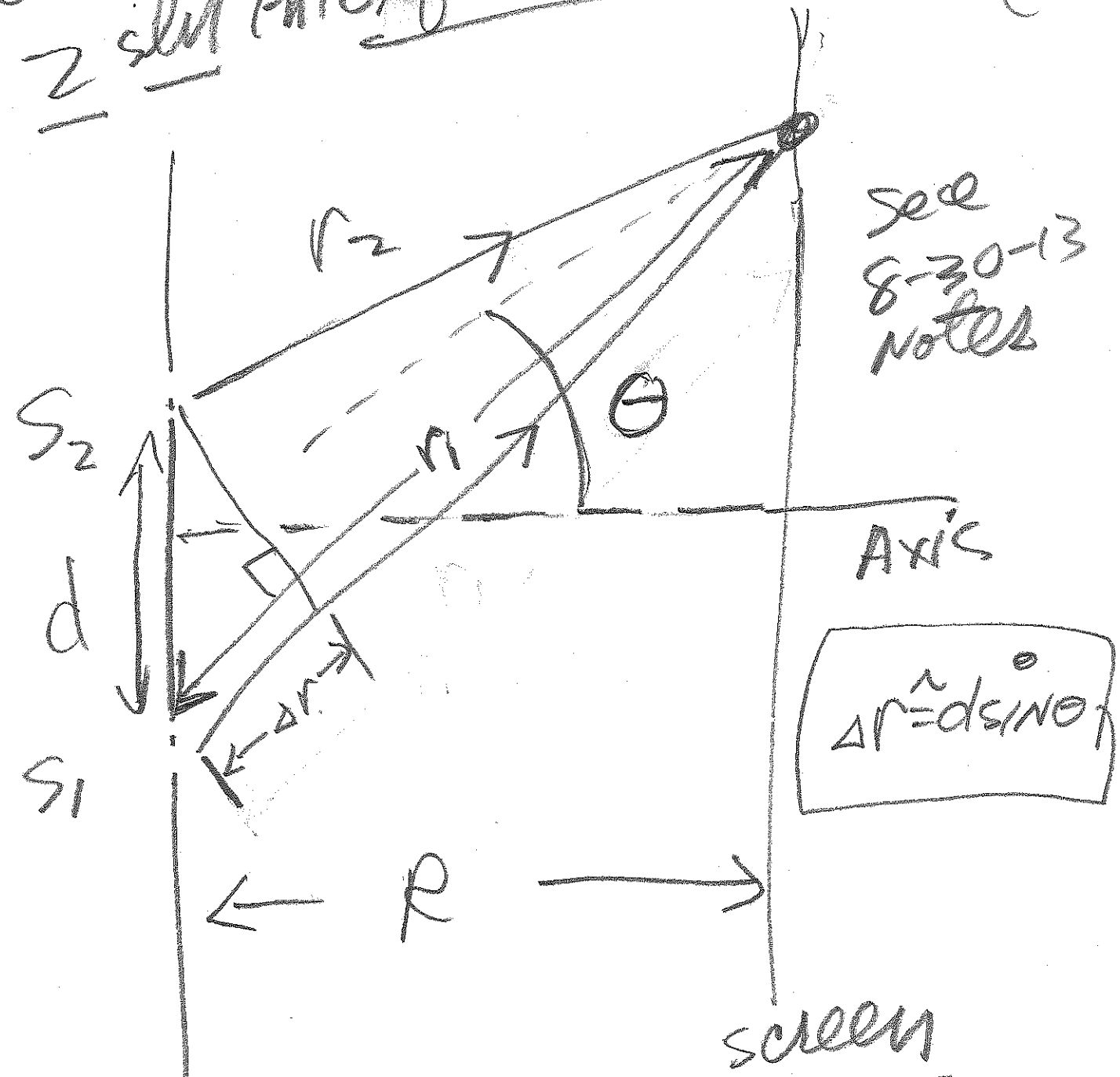
10-15-13 4C

2 slit interference: Ch 35

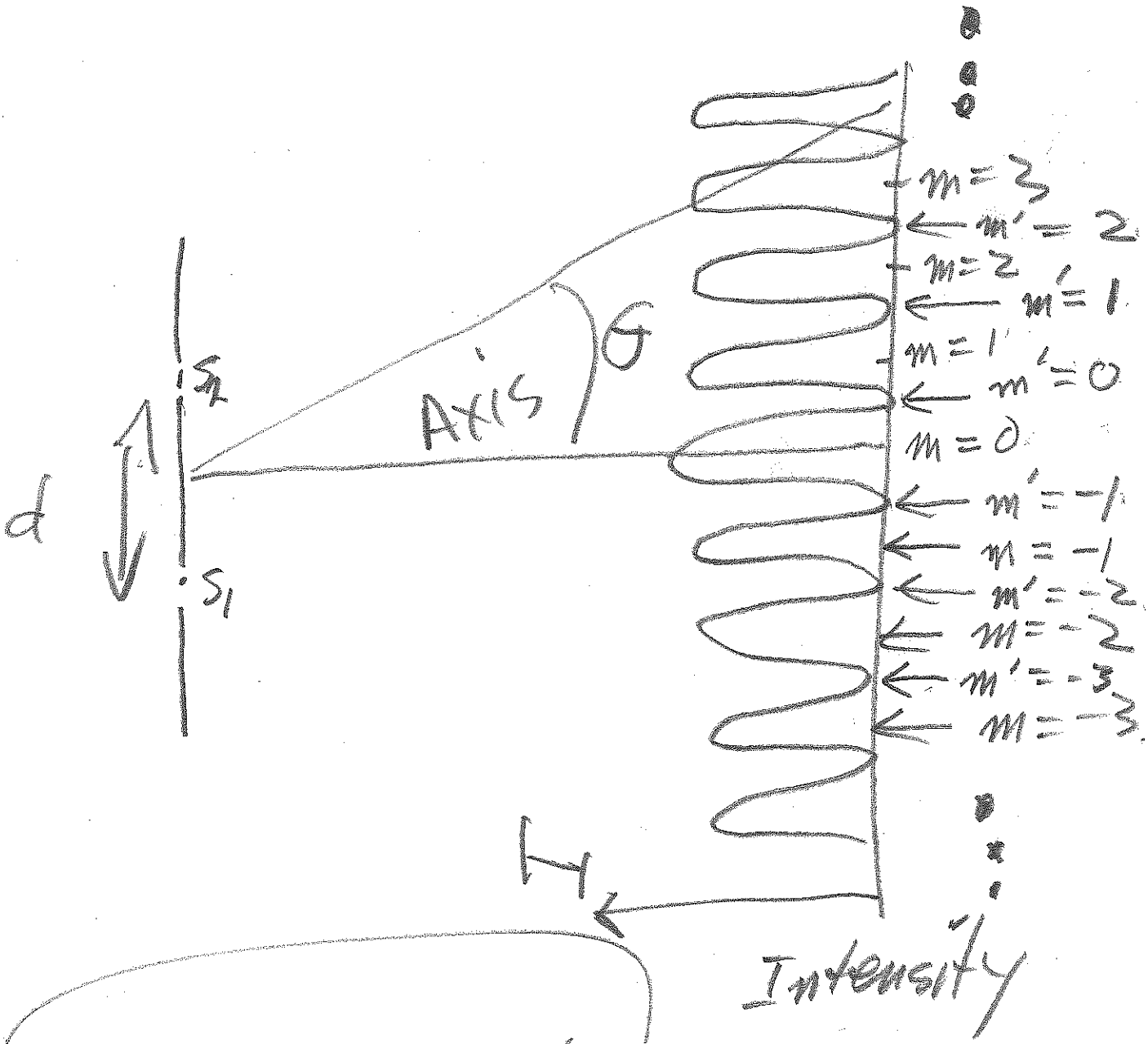


see 8-20-13 notes

$\Delta r \approx d \sin\theta$

$\Delta r = r_1 - r_2 \approx d \sin\theta$ if $R \gg d$

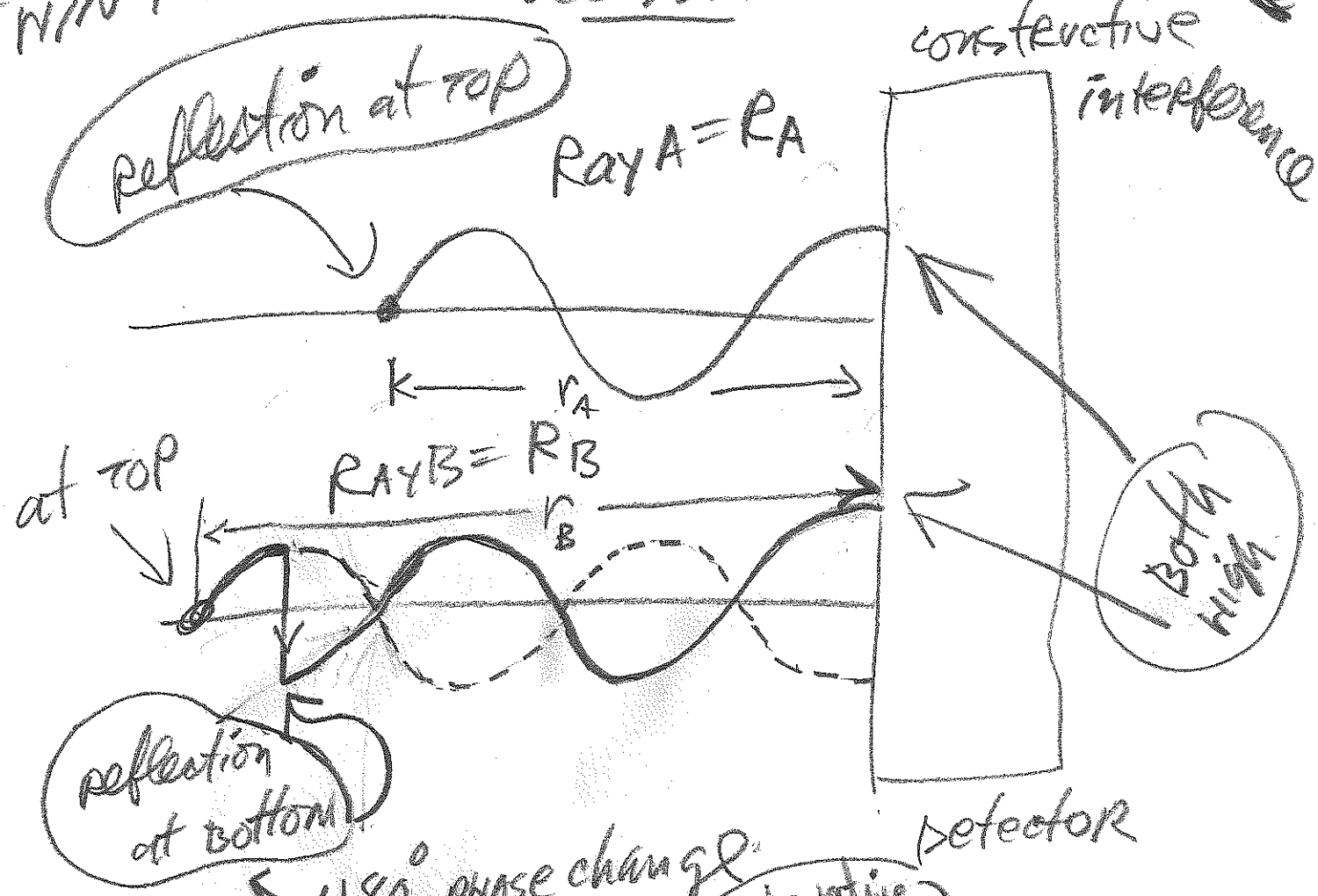
At screen { constructive: $d \sin\theta = m\lambda$
destructive: $d \sin\theta = (2m+1)\frac{\lambda}{2}$



$$I = I_0 \cos^2 \frac{\phi}{2}$$

$$\phi = \frac{2\pi}{\lambda} \cdot d \sin\theta \rightarrow I = I_0 \cdot \cos^2\left(\frac{\pi d \sin\theta}{\lambda}\right)$$

THIN FILMS sec 35.4



see page 490 mechanical analog

glass ($n \approx 1.53$) constructive interference:

$$2t = r_B - r_A = \frac{\lambda}{2}$$

role reversal!

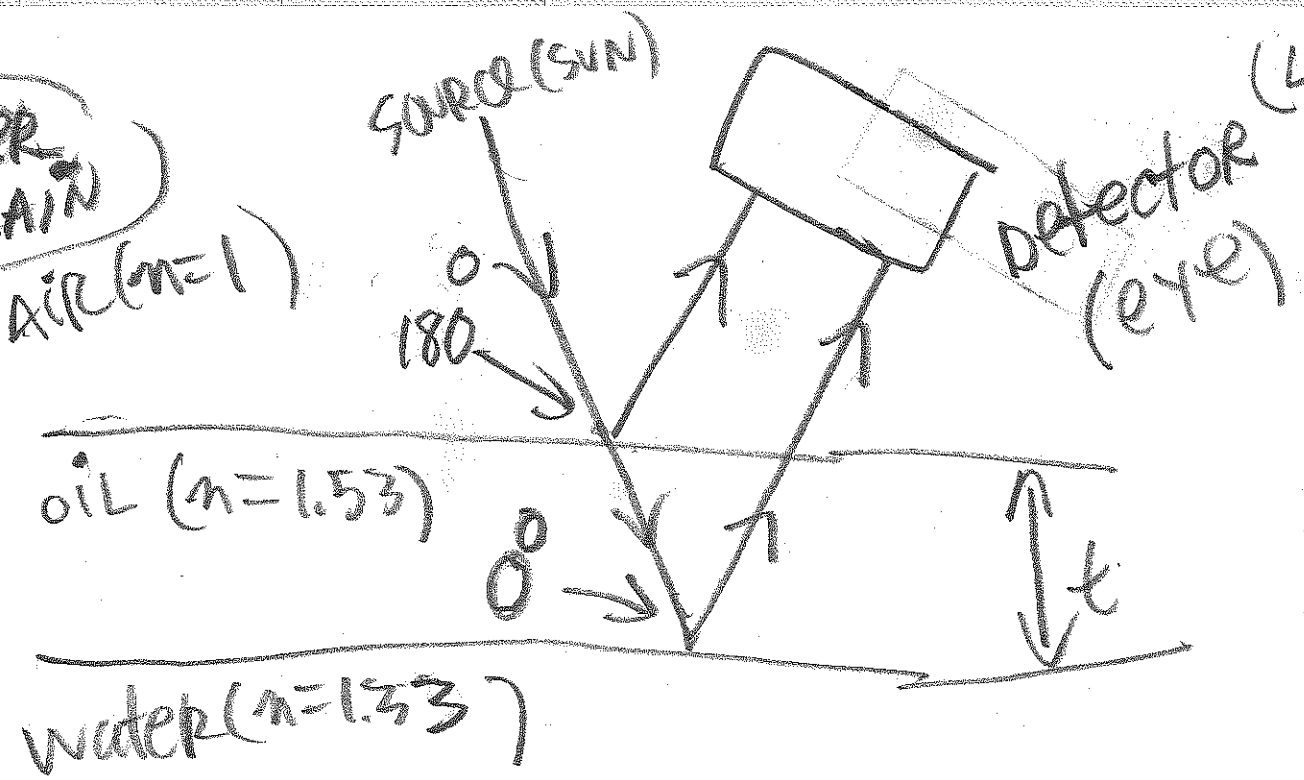
fig 35.12

Air gaps.

general:

$$r_B - r_A = 2t = (2m+1)\cdot\frac{\lambda}{2}$$

AFTER A RAIN



RAINBOWS on streets.

constructive interference

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

NOTE: $\lambda^* = \frac{\lambda_0}{n_{OIL}}$

$\lambda_0 \cong \lambda_{AIR}$ $(n=1)$

$\lambda_0 = \lambda_{VACCUM}$

$\lambda_{red_0} = 625nm \Rightarrow \frac{625nm}{1.53}$ *

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Data Sheet THIN LENS: DETERMINATION OF f (converging lens.)

do		
	d_{obest}	
	Δd_{oinst}	
	$(d_{omax} - d_{omin})/4$	
	Δd_o (larger of previous two.)	
di		
	d_{ibest}	
	$\Delta d_{i\ inst}$ = ERROR = L.C/2 = 0.05CM	
	$(d_{imax} - d_{imin})/4$ = ERROR	
	Δd_i (larger of previous two.) ERROR = LARGER OF PREVIOUS	
f_{best}	$d_{obest} * d_{ibest}/(d_{obest} + d_{ibest})$ =	

Compare f_{best} and f_{acc} with the overall error, which gives the range, as discussed in class. Does the accepted value of f fall within the range centered at the best value? Hint: Check if $f_{min} < f_{acc} < f_{max}$, where f_{min} is the minimum possible using the values of the uncertainty and plugging into the formula by *subtracting the uncertainty* in the numerator and *adding the uncertainty* in the denominator; similar reverse logic should be used to get f_{max}: add in the numerator and subtract in the denominator.

d_o, d_i are averages

$$f_{MAX} = \frac{(d_o + \text{ERROR}) \cdot (d_i + \text{ERROR})}{(d_o - \text{ERROR}) + (d_i - \text{ERROR})}$$

[ERROR = LARGER of 2.]

$$f_{MIN} = \frac{(d_o - \text{ERROR}) \cdot (d_i - \text{ERROR})}{(d_o + \text{ERROR}) + (d_i + \text{ERROR})}$$

Percent error for f

$$\frac{|f_{acc} - f_{best}|}{f_{acc}} \times 100\%$$

Theoretical magnification m = $-d_i/d_o$

ACTUAL MAGNIFICATION m = h_i/h_o ; $h_i < 0$

Percent error for magnification m

Show work for these calculations here: