

10-21-13

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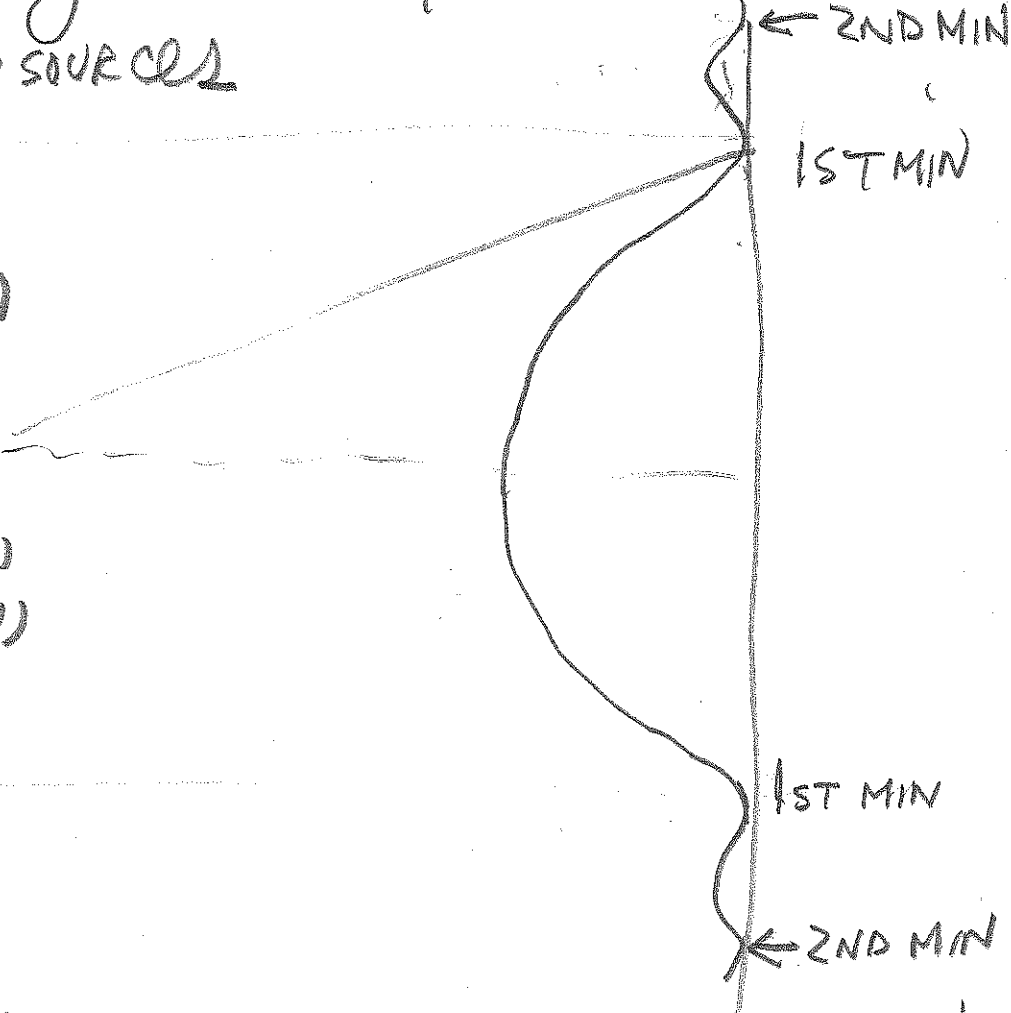
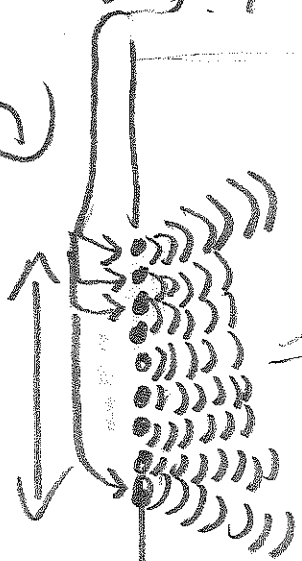
CH 36

1 slit diffraction: slit is
NOW LARGER compared to CH 35,

Allowing MORE Huygens wavelets

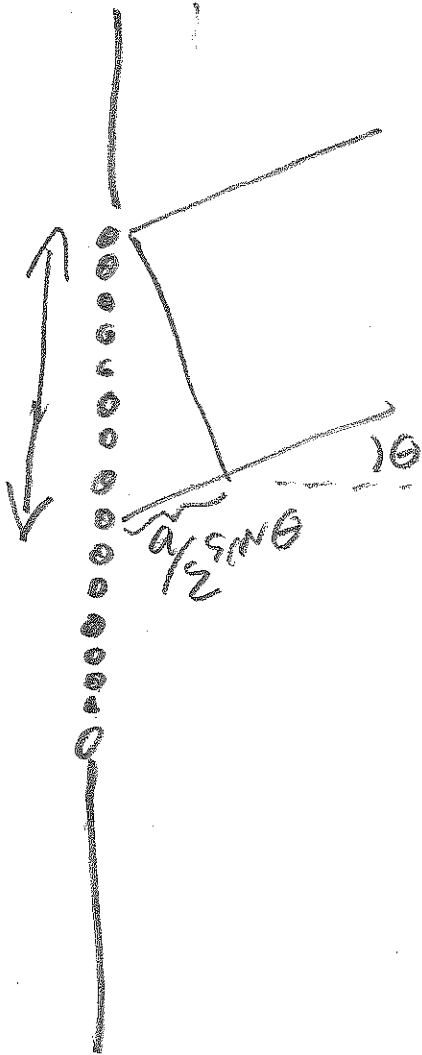
LARGER SLIT, MANY SOURCES

a



Light bends; NO SHARP SHADOW!

Divide slit into $\frac{1}{2} S$. (2)



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

$$a \sin \theta = 2\lambda \quad (m=1)$$

Divide into $\frac{1}{4} S$

$$\frac{a}{4} \sin \theta = \lambda$$

$$a \sin \theta = 4\lambda \quad (m=2)$$

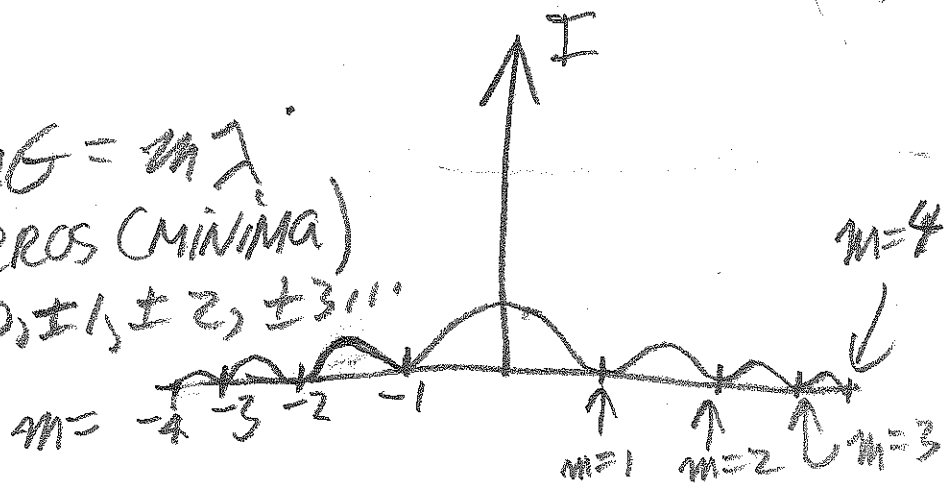
Divide into $\frac{1}{6} S$

$$\frac{a}{6} \sin \theta = \lambda$$

$$a \sin \theta = 6\lambda \quad (m=3)$$

$a \sin \theta = m\lambda$
for zeros (minima)

$m = 0, \pm 1, \pm 2, \pm 3, \dots$



(3)

Intensity pattern 1 slit Diffraction

FORMULA:

$$I = I_0 \left[\frac{\sin \beta/2}{\beta/2} \right]^2$$

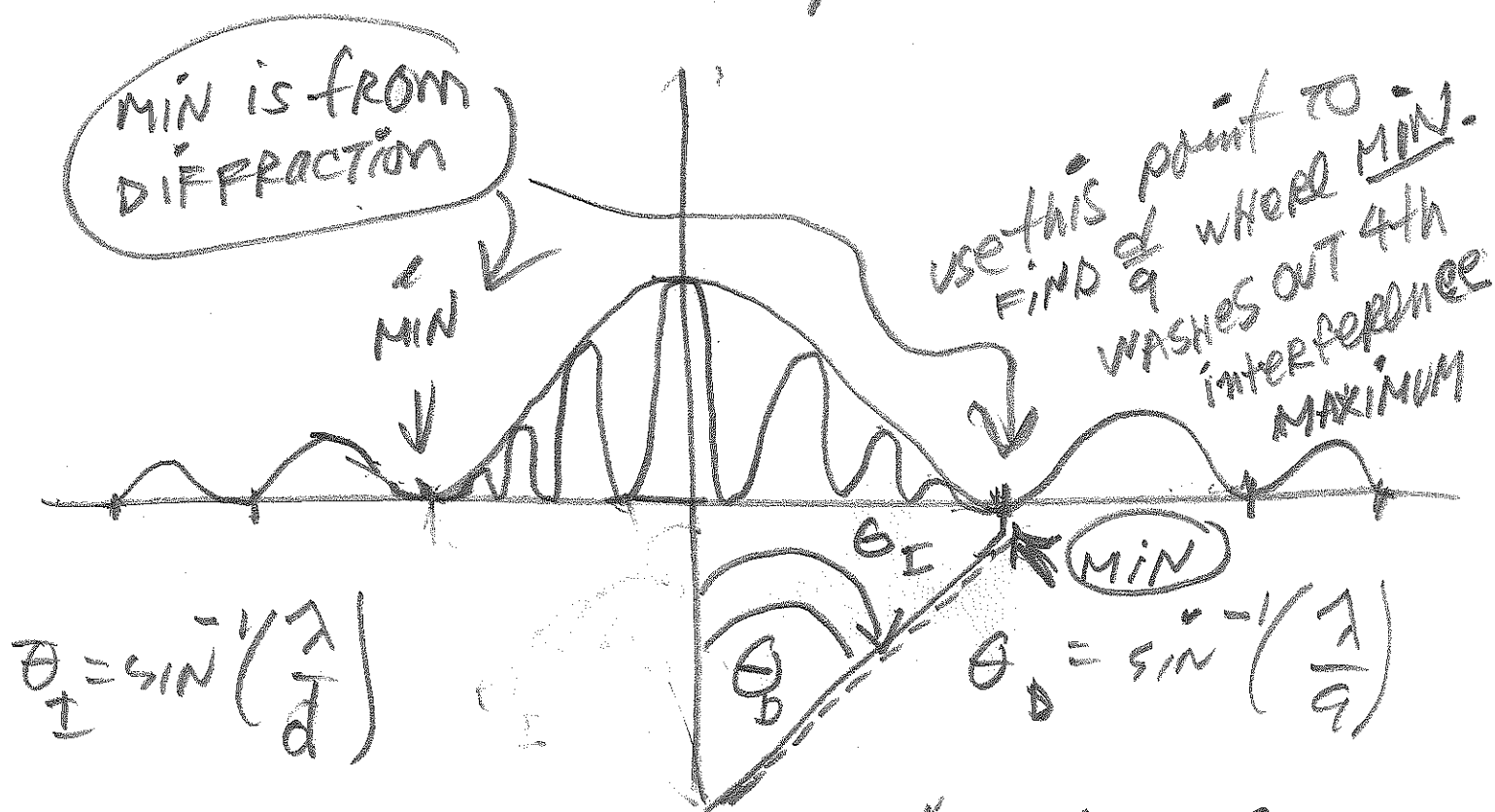
$$\beta = \frac{2\pi a \sin \theta}{\lambda} \text{ where } \frac{a}{\lambda} \text{ is NOT SMALL.}$$

NOTE: $\beta = 0$ means $\theta = 0$

$I = I_0$ via L'HOSPITAL'S rule

Section 36.4

2 slits with both interference (2 slit) and diffraction (within each slit) effects



$$\theta_I = \sin^{-1}\left(\frac{\lambda}{d}\right)$$

$$\theta_D = \sin^{-1}\left(\frac{\lambda}{a}\right)$$

$d > a \Rightarrow \theta_I < \theta_D$ since $\frac{\lambda}{d} < \frac{\lambda}{a}$

From graph FIND $\frac{d}{a}$:

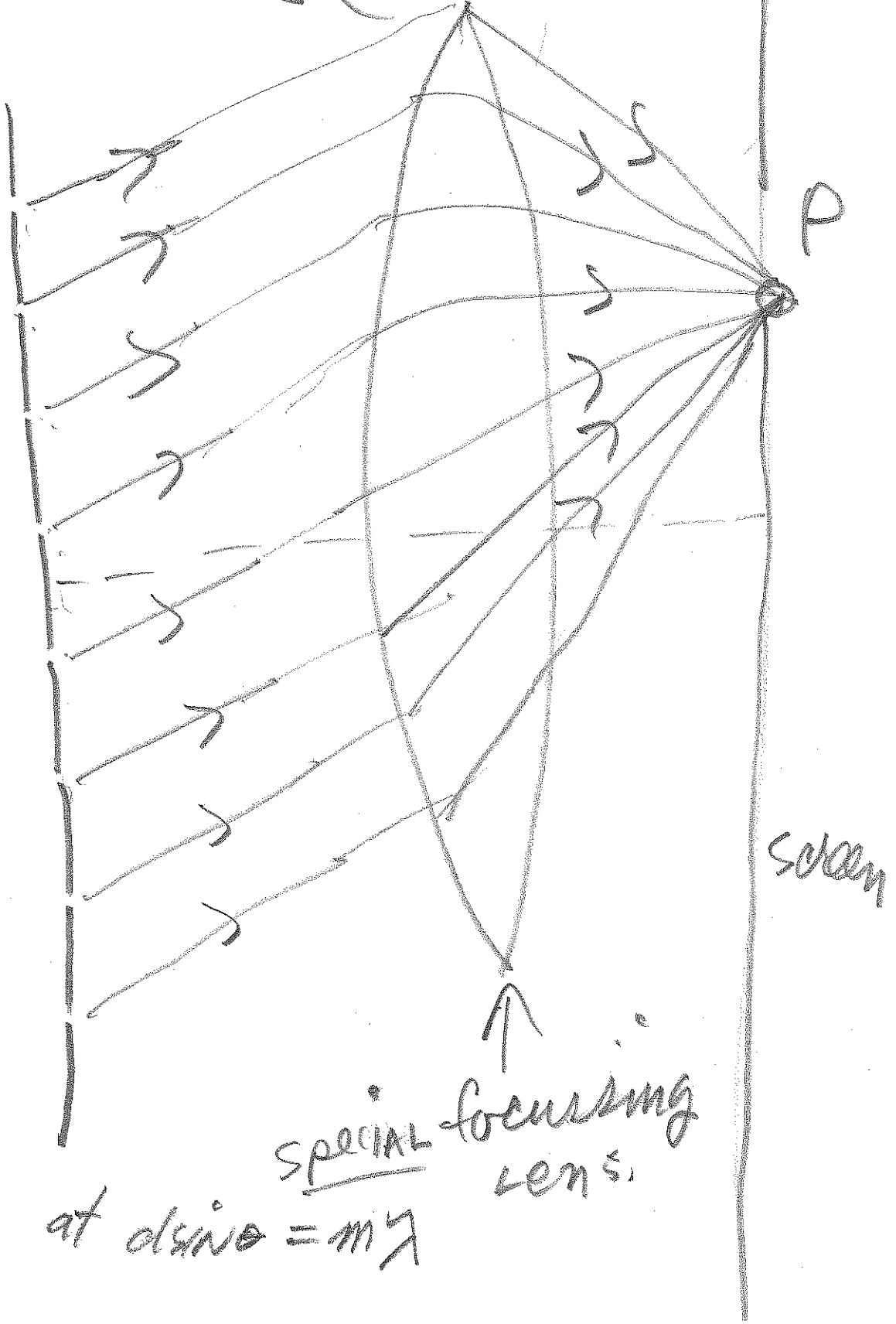
$$\left. \begin{aligned} a \sin \theta_D &= \lambda \\ d \sin \theta_I &= 4\lambda \end{aligned} \right\} \theta_I = \theta_D \Rightarrow$$

$$\sin \theta_D = \sin \theta_I$$

$$\frac{\lambda}{a} = \frac{4\lambda}{d}$$

$\rightarrow \boxed{d/a = 4}$

several slits ($N=8$)

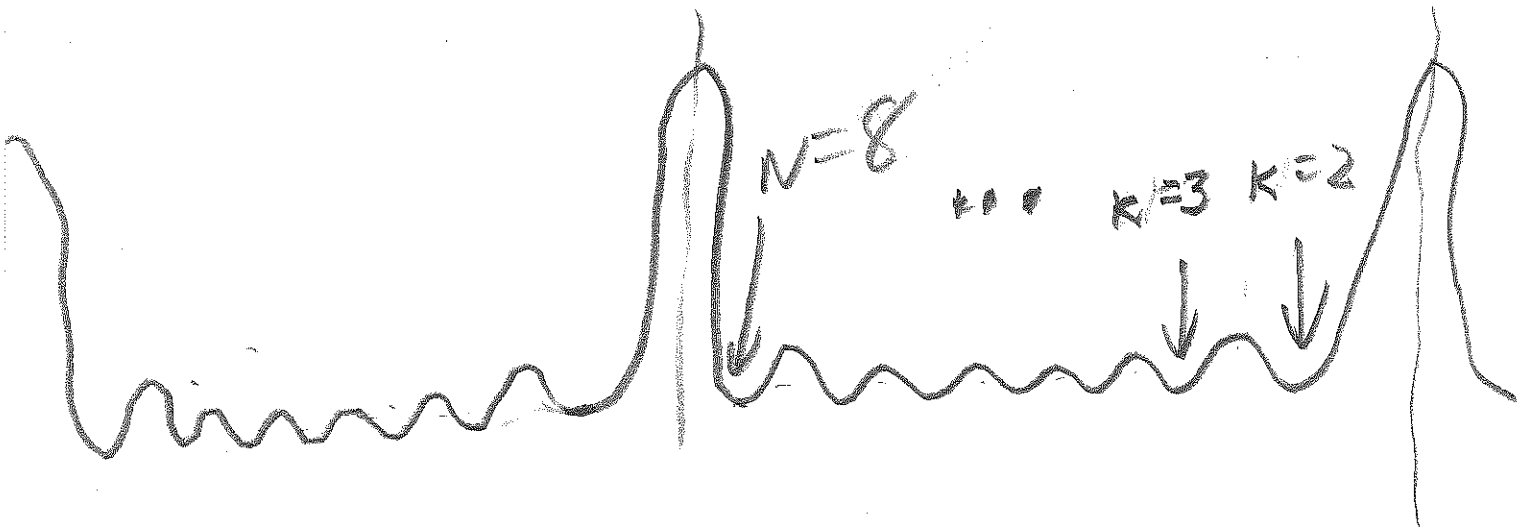


MAXIMA at $d \sin \theta = m \lambda$

SPECIAL focussing lens.

fig 36.15 (b)

$N=8$



$m=0$ $m=1$
 $\frac{2\pi}{k} = \phi$ for each possible k
 WAY TO ADD 8 VECTORS TO ZERO

fig 36.14 (a)
 $k=2$
 $\phi = \frac{2\pi}{2} = \pi = 180^\circ$
 $\theta = \pi$
 $\pi = 180^\circ$

fig 36.14 (b)
 $k=8$
 $\frac{2\pi}{8} = \frac{\pi}{4} = 45^\circ = \phi$
 $\frac{\pi}{4}$
 $\frac{\pi}{4} = \phi$

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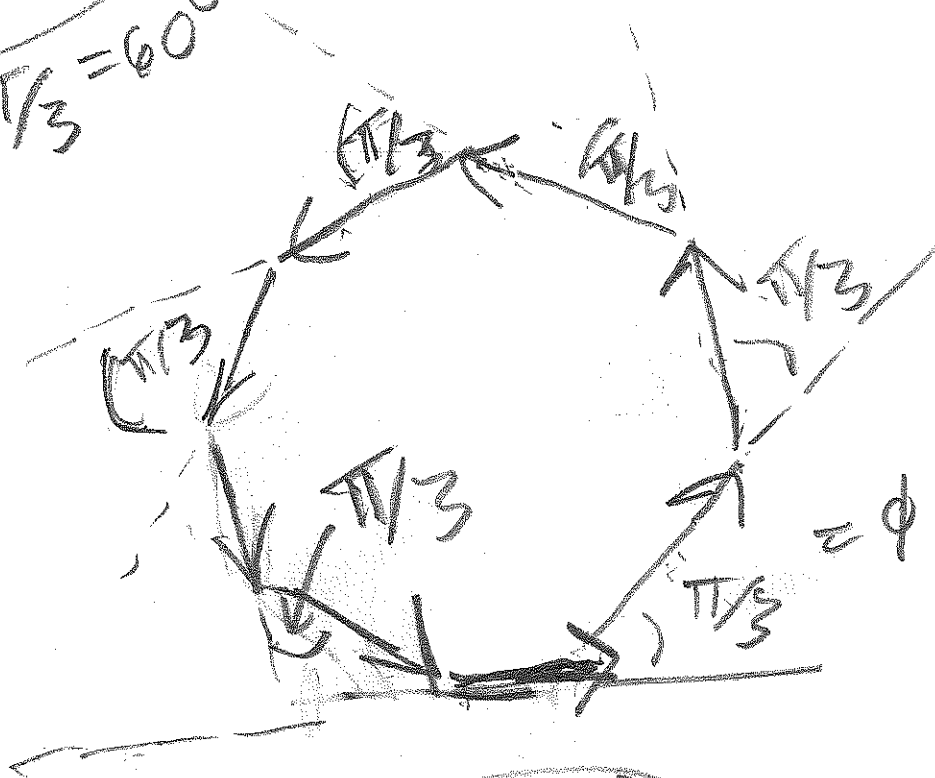
FOR SUBMINIMA, for N slits,
 $N-1$ MINIMA between MAXIMA.



$k=6$

$\frac{2\pi}{6} = \pi/3 = 60^\circ$

CHUCK TRICK $\phi = 60^\circ = \frac{\pi}{3}$



$k=6$

$\phi = \frac{2\pi}{6} = \frac{\pi}{3}$

$$10 = 21 - 13$$

6

45

a

— CHLG

$$v = 340 \text{ m/s}$$

$$f_L = (392 \text{ Hz}) \left(\frac{v - v_L}{v} \right)$$

relative speed of
L and wave is

$$340 - 15 = 325 \frac{\text{m}}{\text{s}}$$

$$f_L = (392 \text{ Hz}) \left(\frac{325}{340} \right)$$

$$= 374.76 \text{ Hz}$$

b

$$469.3 = (392 \text{ Hz}) \left(\frac{355}{340} \right) \text{ Doppler}$$

SHIFT from relative velocity
of L and waves from train = 355 m/s

(9)

$$\begin{aligned}
 \text{(b.) } f_{\text{final}} &= (409.2941 \text{ Hz}) \left(\frac{v}{v \pm v_s} \right) \\
 &= (409.2941) \left(\frac{340}{340 + 35} \right) \\
 &= (409.2941) \left(\frac{340}{375} \right) = 371.1 \text{ Hz}
 \end{aligned}$$

SUMMARY:

L moving,
SOURCE at
REST:

$$f' = f \cdot \left(\frac{v \pm v_L}{v} \right)$$

S moving,
listener at REST:

$$f'' = f \cdot \left(\frac{v}{v \pm v_s} \right)$$

$$v = 340 \frac{\text{m}}{\text{s}}$$

TOGETHER: $f \cdot \left(\frac{v \pm v_L}{v \pm v_s} \right) =$ SHIFT
when
L and S
ARE MOVING

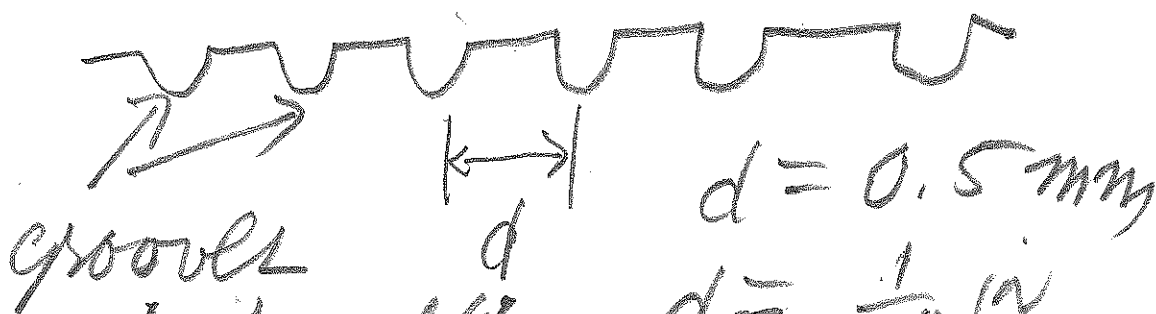
C) Beat frequency
and is it detectable
by a human?

$$f_{\text{beat}} = |374.7 - 371.1| \text{ Hz} \\ = |3.6 \text{ Hz}| = 3.6 \text{ Hz}$$

now LAB e

$$\frac{1 \text{ s}}{3.0} = 0.27 \text{ (s)}$$

METAL RULER "DIFFRACTION" detectable



ARTISTS' DRAFTING

$$d = \frac{1}{64} \text{ in}$$

RULER - SEARS,

d = 1 mm COULD WORK
DOCKSTADT (CONABET)

INSTRUCTIONS TO REQUISITIONER

1. Type or print legibly - double space between items.
2. Group items for one vendor. No more than two vendors on a requisition.
3. Room number required for delivery on all items. Fill in space below.

REQUISITION FOR EQUIPMENT, SUPPLIES, APPARATUS AND SERVICE

CHABOT LAS POSITAS COMMUNITY COLLEGE DISTRICT

No. 60893

Date written 6/15 20 12 Delivery Required By: 9/1/12

Chabot Las Positas District
 Department MUSIC/SOTA
 Staff Member Travis Harris
 PURCHASING OFFICE USE ONLY

QUAN.	UNIT	DESCRIPTION (CATALOG NO., SIZE, DIMENSIONS, ETC.)	SUGGESTED VENDOR	EST. UNIT PRICE	PURCHASED FROM	UNIT PRICE	TOTAL AMOUNT
1		Roland RD-700DX Piano w/AMP pedal	Guitar Center	2999			
1		Roland KC-880 Keyboard Amplifier		999			
1		Keyboard Stand, double braced, heavy duty Item # 107236085		520			
1		Keyboard Bench Item # 100898030		33.98			
1		Monster Keyboard Cable 12 Ft.		75			
		Guitar Center					
		5925 Shellmound St. Emeryville, CA 94608 Ph # 510-559-1055					
TOTAL =				3958.18			
							6130067

DIVISION DEAN/ADMINISTRATOR [Signature] a/14/12

DIVISION DEAN/ADMINISTRATOR [Signature]

ACCOUNT NO. If this account number is capital outlay, a room number must appear in the next box. BOND

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ROOM NO.

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TERMS



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No. of Pages: 3
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Contact: JOB PLACEMENT

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