Wave Equation

$f(x,t) = A\cos(Kx \pm \omega t \pm \delta)$

$f = \frac{\omega}{2\pi}$ Time Period $= \frac{2\pi}{\omega}$

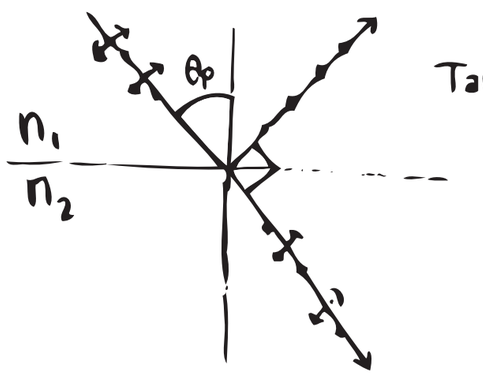
$\lambda = \frac{2\pi}{K}$ Wave # $= \frac{K}{2\pi}$

$\frac{\lambda}{\text{Time Period}} = \vec{V} = \lambda f = \omega/K$

Polarization

Unpolarized Light → Polarized → $\frac{1}{2}$ Intensity

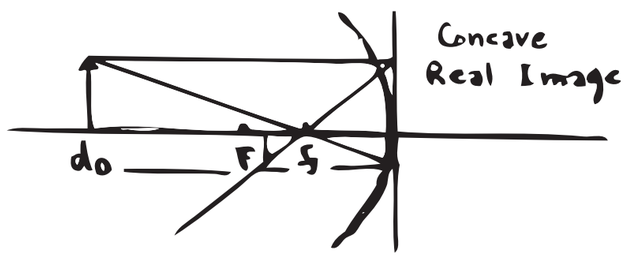
Polarized Light → Polarized Filter → $I = I_0\cos^2(\theta)$



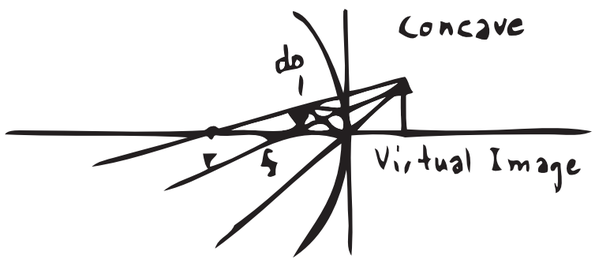
$\tan\theta_p = \frac{n_2}{n_1}$

Mirrors

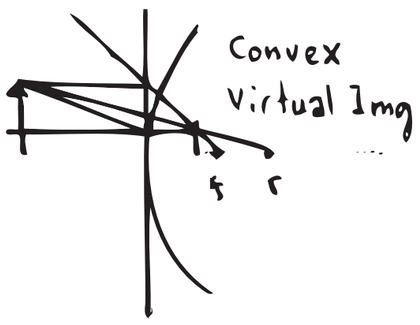
$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$, $m = \frac{-d_o}{d_i}$



$d_o = +$
$d_i = +$
$f = +$



$d_o = +$
$d_i = -$
$f = +$



$d_o = +$
$d_i = -$
$f = -$

Mirror Type	d_o	Image Orient	Image Size vs Object	Image Location	Real or Virtual
Convex	$>f$	Upright	Smaller	Behind Mirror	V
Concave	$>f$	Invert	Smaller	Front Mirror	R
Concave	$<f$	Upright	Larger	Behind Mirror	V

Avg Power of a Wave

$P_{avg} = 0.5\mu\vec{v}\omega^2A^2$

Energy in a given Length

$(\Delta E)_{avg} = 0.5\mu\omega^2A^2 \cdot \Delta x$

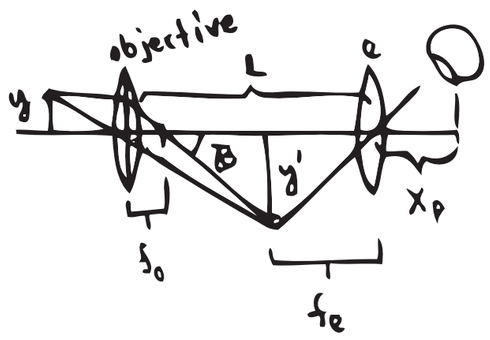
Decibels

$Db = (10\ Db)\ \text{Log}\left[\frac{I}{I_0}\right]$

Point Source Sound Intensity

$I = \frac{P_{avg}}{\text{Area}}$ $I = \frac{P_{avg}}{4\pi r^2}$

Compound Microscope

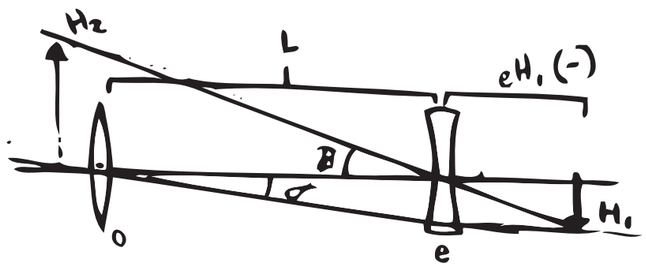


$m_{objective} = \frac{y'}{y} = \frac{-L}{f_o}$

$M_e = \frac{x_p}{f_e}$

$M = m_o M_e = \frac{-L \cdot x_p}{f_o \cdot f_e}$

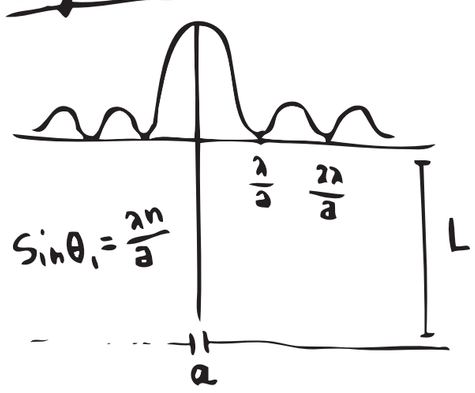
TeleScope



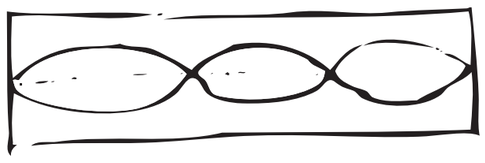
$\frac{1}{\infty} + \frac{1}{eH_1} = \frac{1}{f_o}$, $\frac{1}{eH_1(-)} + \frac{1}{dH_2} = \frac{1}{f_e(-)}$

$M = \frac{-f_o}{f_e}$

Single Slit

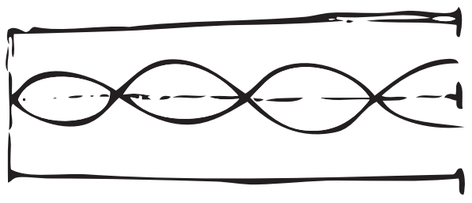


Doppler Effect → $f_r = \left[\frac{V \pm U_r}{V \pm U_s}\right] f_s$



$f_n = \frac{\vec{V}}{\lambda_n} = \frac{\vec{V}}{2L/n}$, n = 1,2,3...

$f_n = n\frac{\vec{V}}{2L} = nf_1$ $n = 1,2,3,4...$ $n = \frac{2Lf_n}{V}$



$L = \frac{\lambda_n \cdot n}{4}$, n = 1,3,5...

$f_n = \frac{\vec{V}}{\lambda_n} = \frac{n\vec{V}}{4L} = nf_1$ $n = 1,3,5...$ $n = \frac{4L \cdot f_n}{V}$

Reflection & Refraction

Snell's Law: $n_1\sin\theta_1 = n_2\sin_2$

$n = \frac{c}{v}$

$V = \frac{c}{n}$

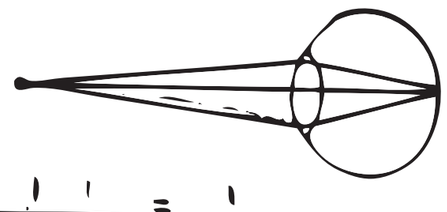
$\frac{\sin\theta_1}{\lambda_1} = \frac{\sin\theta_2}{\lambda_2}$

$\frac{\sin\theta_1}{V_1} = \frac{\sin\theta_2}{V_2}$

Eyes

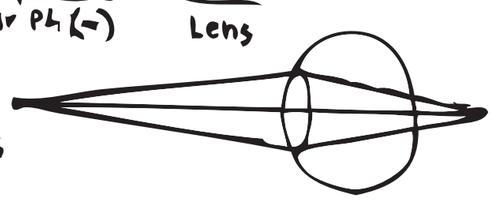
Dioptre $= 1/f = D$, f in metres

Regular



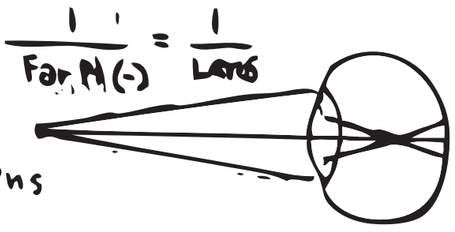
$\frac{1}{d_o} + \frac{1}{\text{Near Pt}(-)} = \frac{1}{\text{Lens}}$

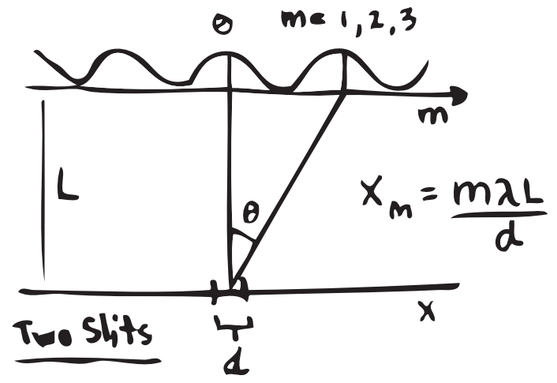
Farsighted
Needs Converging Lens



$\frac{1}{d_o} + \frac{1}{\text{Far Pt}(-)} = \frac{1}{\text{Lens}}$

Nearsighted
Needs Diverging Lens





$x_m = \frac{m\lambda L}{d}$

Two Slits

Interference

Max (in Phase): $d\sin\theta_m = m\lambda$

(out Phase): $d\sin\theta_m = (m+\frac{1}{2})\lambda$

Phase difference due to path

$\delta = \left(\frac{2t}{\lambda/n}\right)2\pi$

Constructive when
ΔPath $= \lambda/2$
Destructive when
ΔPath $= \lambda$