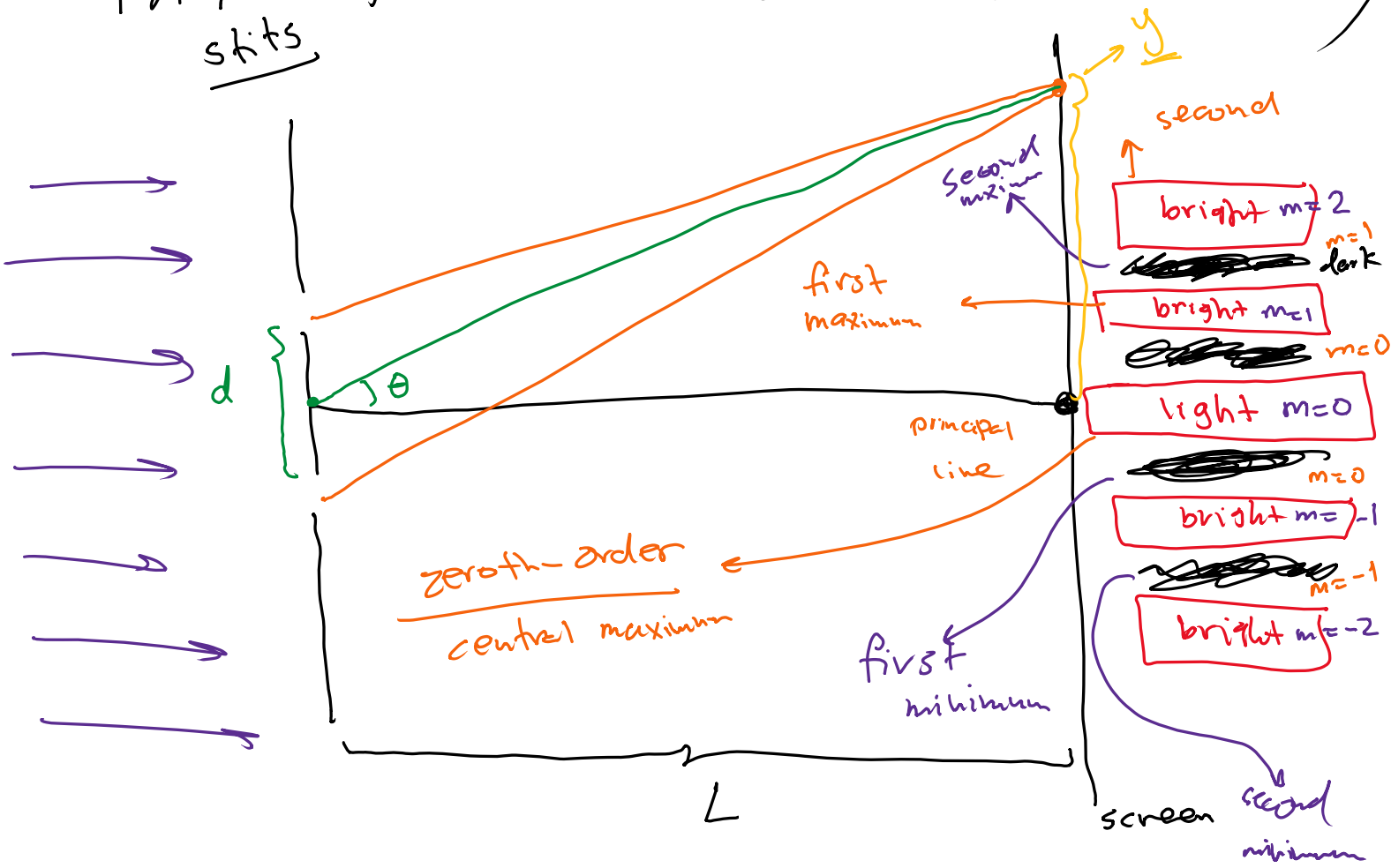
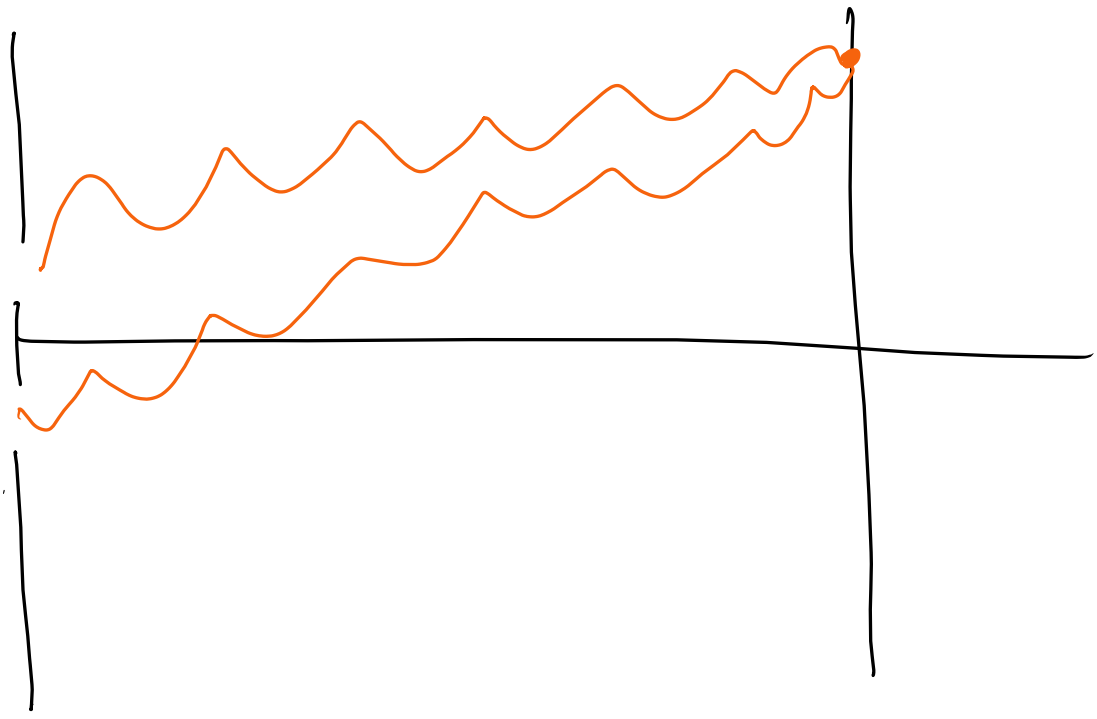
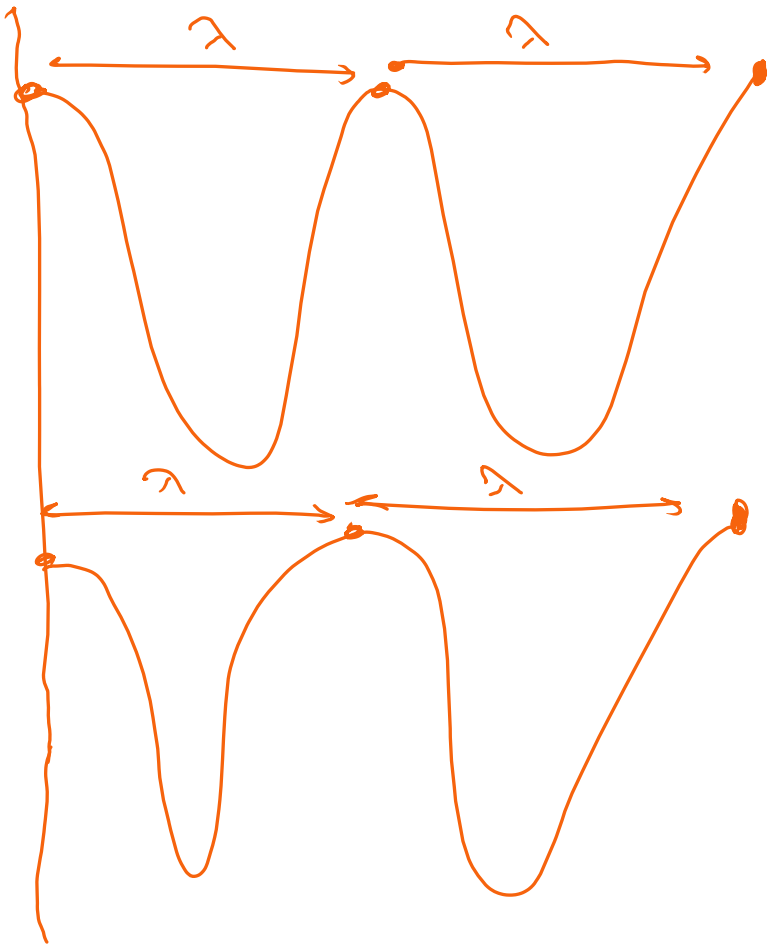
Interference (Young's Exper.)



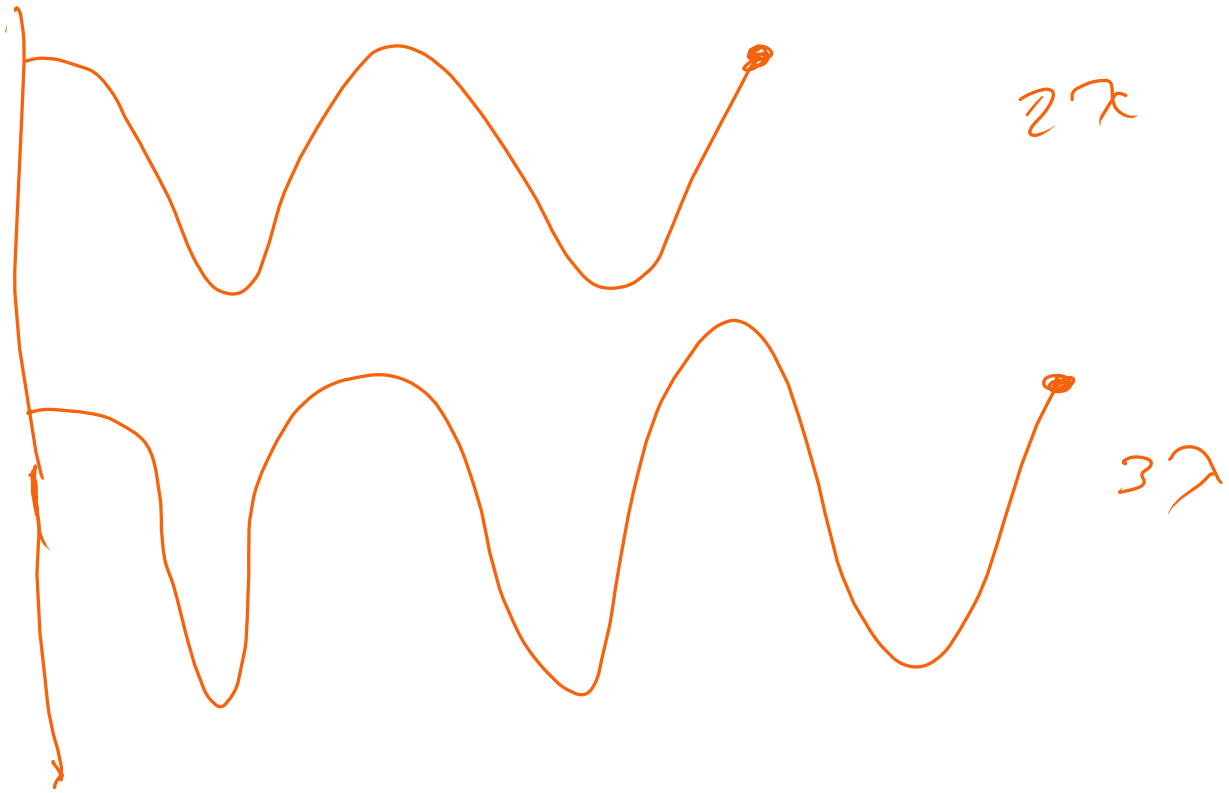
Alternating bright & dark bands / fringes





constructive

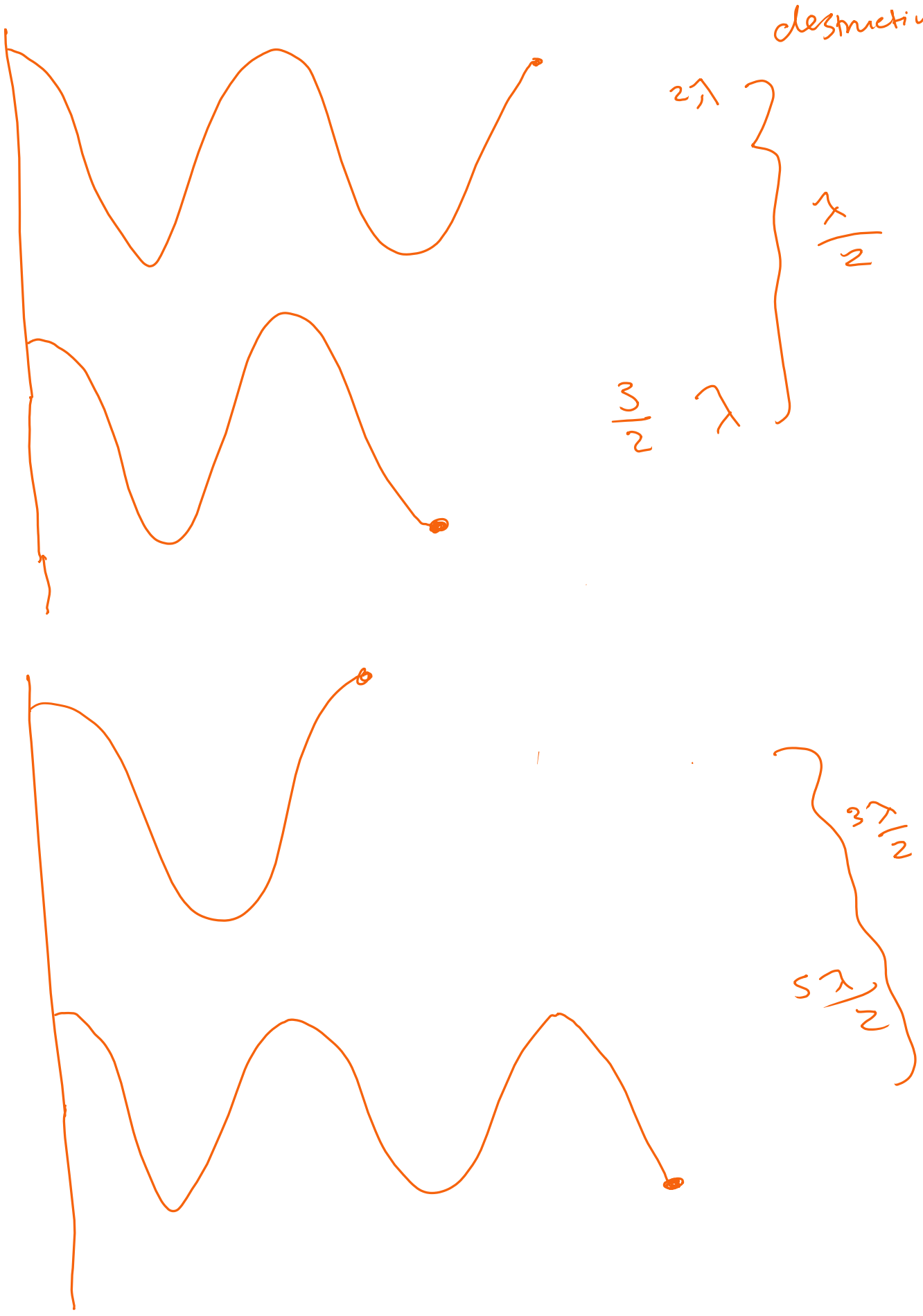
$d = 2\lambda$



constructive :

path difference $= m\lambda$

$m = 0, \pm 1, \pm 2, \pm 3, \pm 4, \ldots$



Destructive :

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

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

path difference $= \delta = d \sin\theta$

constructive $\Rightarrow$ $d \sin\theta = m\lambda$ $\quad m = 0, \pm 1, \pm 2, \ldots$

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

Fifth maximum $\Rightarrow$ $m = 5, -5$

Fifth minimum $\Rightarrow$ $m = 4, -4$

$\tan\theta = \frac{y}{L}$

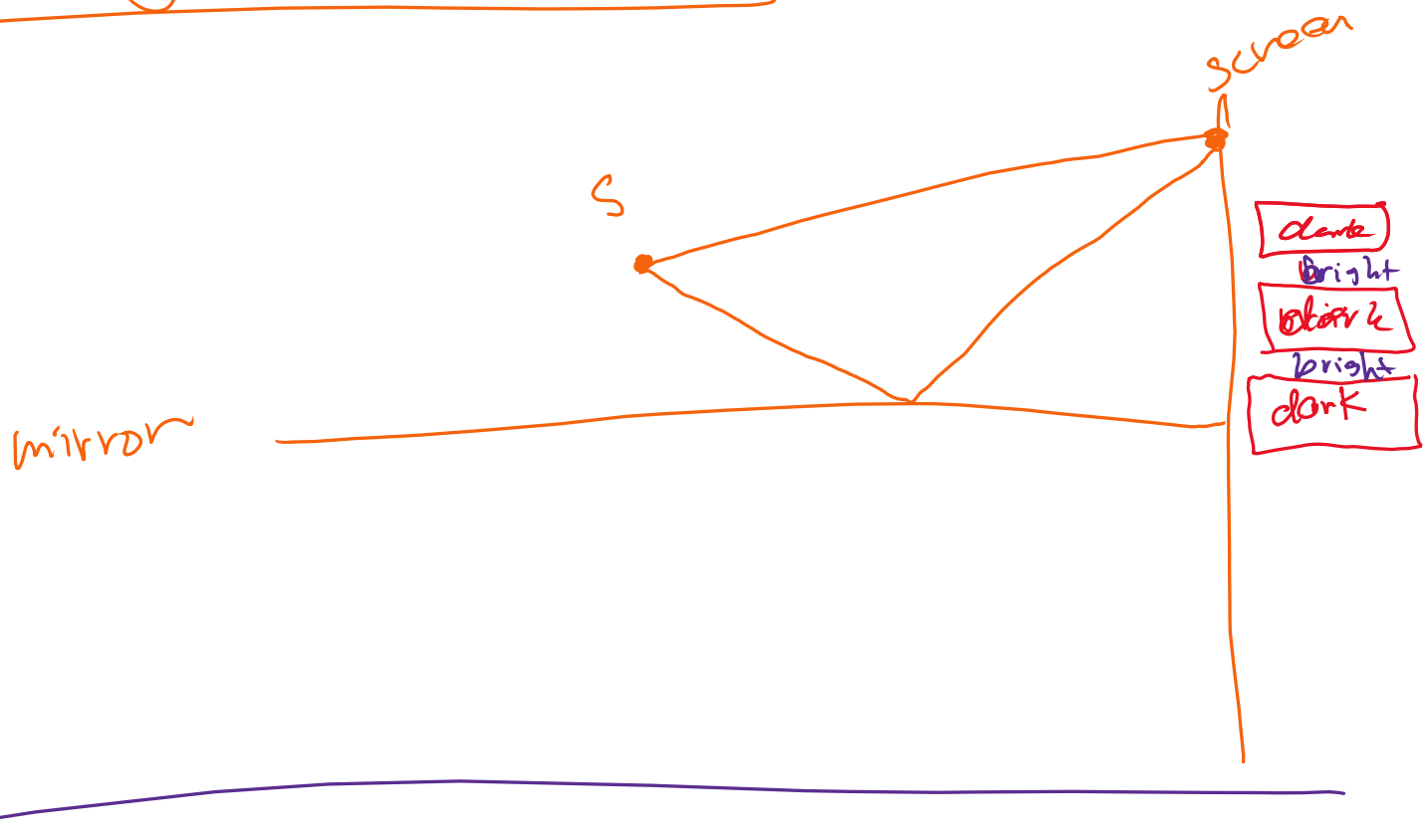
θ is small $\Rightarrow$ $\tan\theta \approx \sin\theta$

$\sin\theta = \frac{y}{L}$

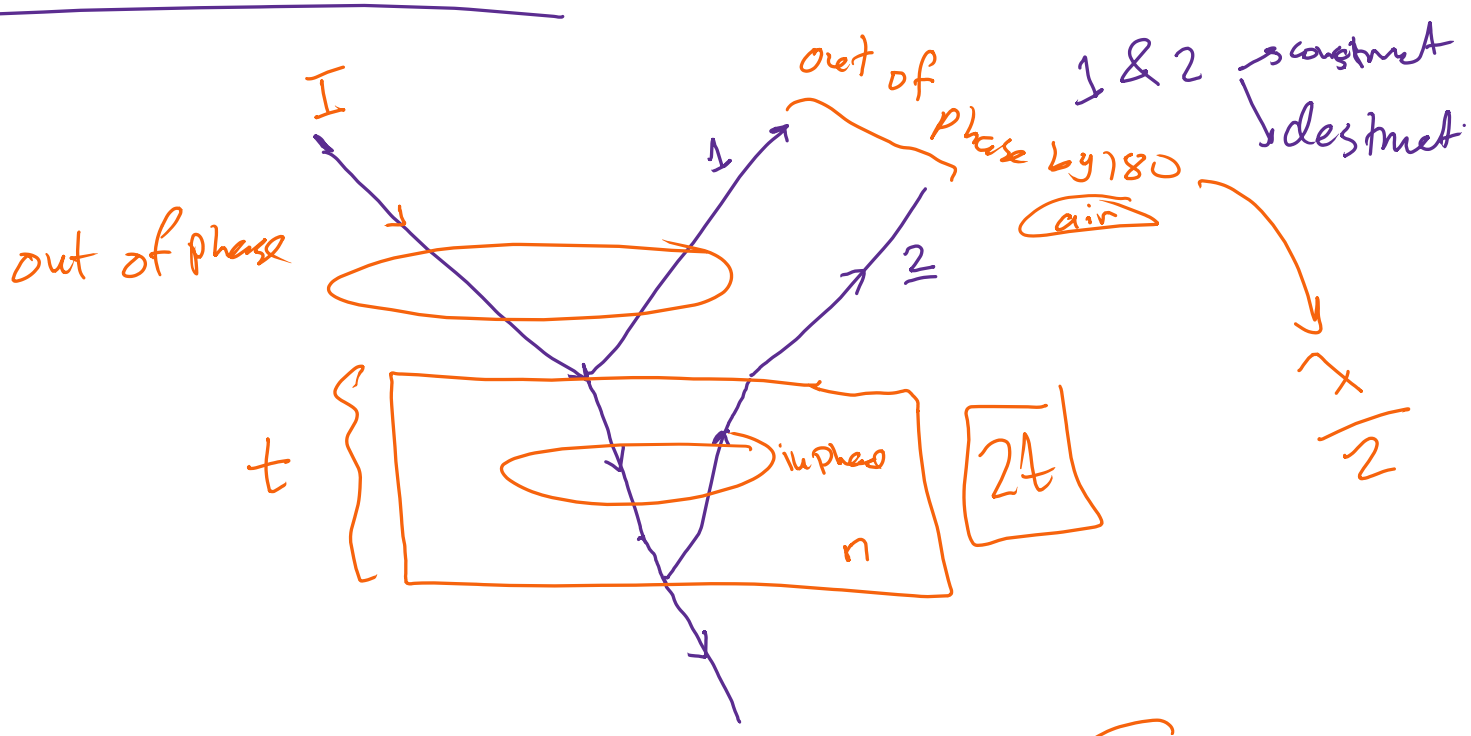
constructive $\Rightarrow$ $d \frac{y_{bright}}{L} = m\lambda$

destructive $\Rightarrow$ $d \frac{y_{dark}}{L} = \left(m + \frac{1}{2}\right)\lambda$

Lloyd's Mirror

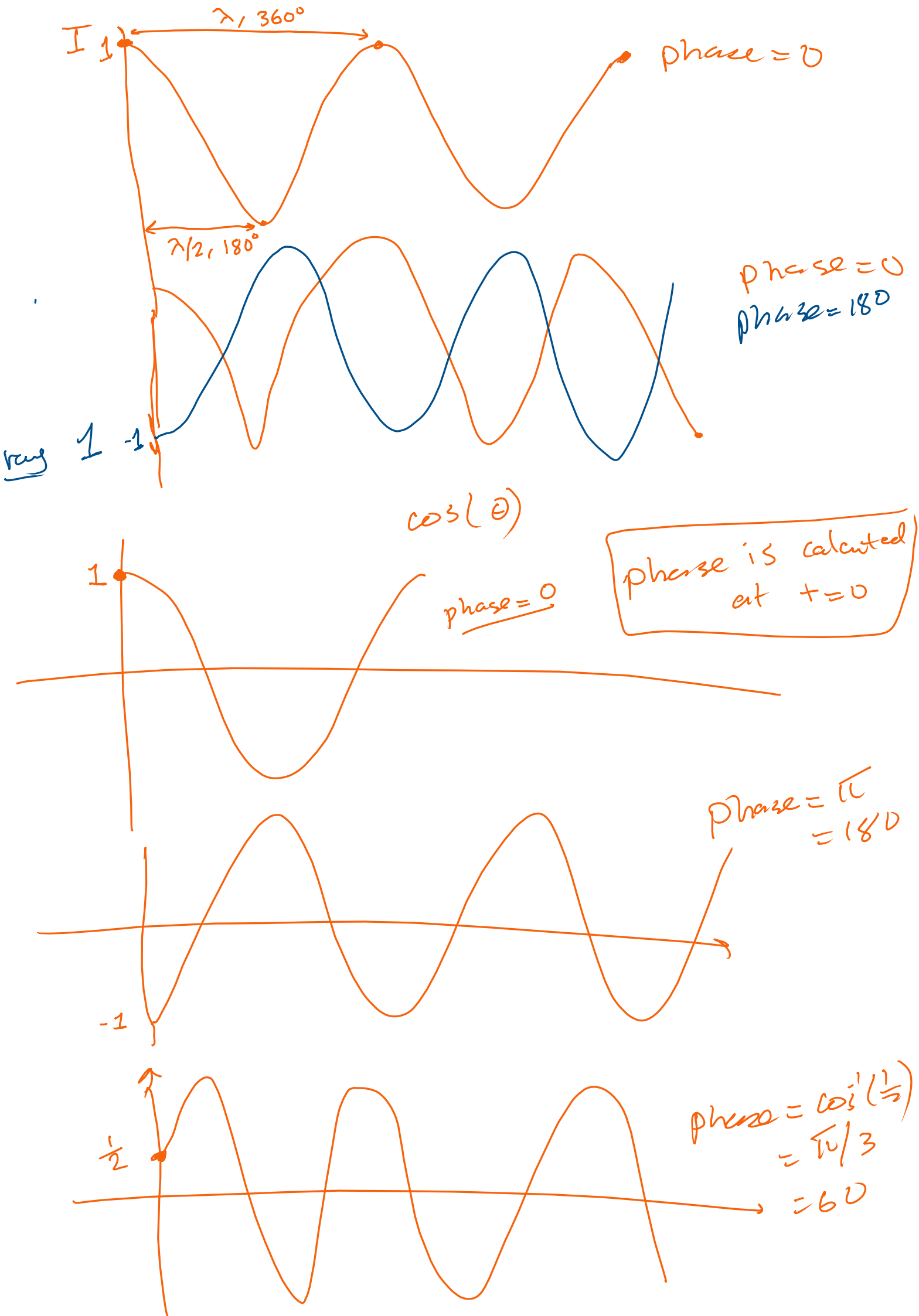


Thin Films



I & ray 1 are 180° out of phase

I & ray 2 are in phase


λ, 360°
I
1
phase = 0
λ/2, 180°
phase = 0
phase = 180
ray
1
-1
cos(θ)
1
phase = 0
phase is calculated at t = 0
phase = π = 180
-1
1/2
phase = cos⁻¹(1/2) = π/3 = 60

if reflection from higher n

$\Rightarrow$ Incident & reflected

out of phase by 180

if reflection from lower n

$\Rightarrow$ Incident & reflected

in phase

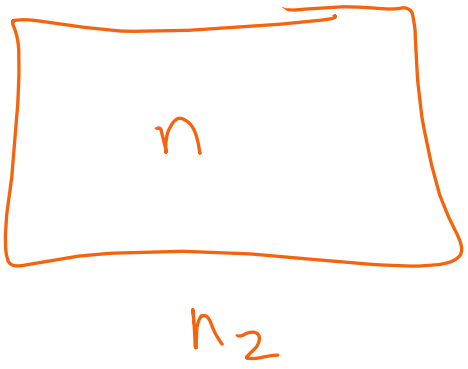
constructive:

$$2t = \left(m + \tfrac{1}{2}\right)\frac{\lambda}{n}$$

destructive:

$$2t = m\,\frac{\lambda}{n}$$

$\Big\}\ m = 0, 1, 2$



$n > n_1$ and $n < n_2$ } $n < n_1$ and $n > n_2$

⇓

swap

destructive:

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

constructive

$$2t = m\frac{\lambda}{n}$$