Single slit

(width = a)

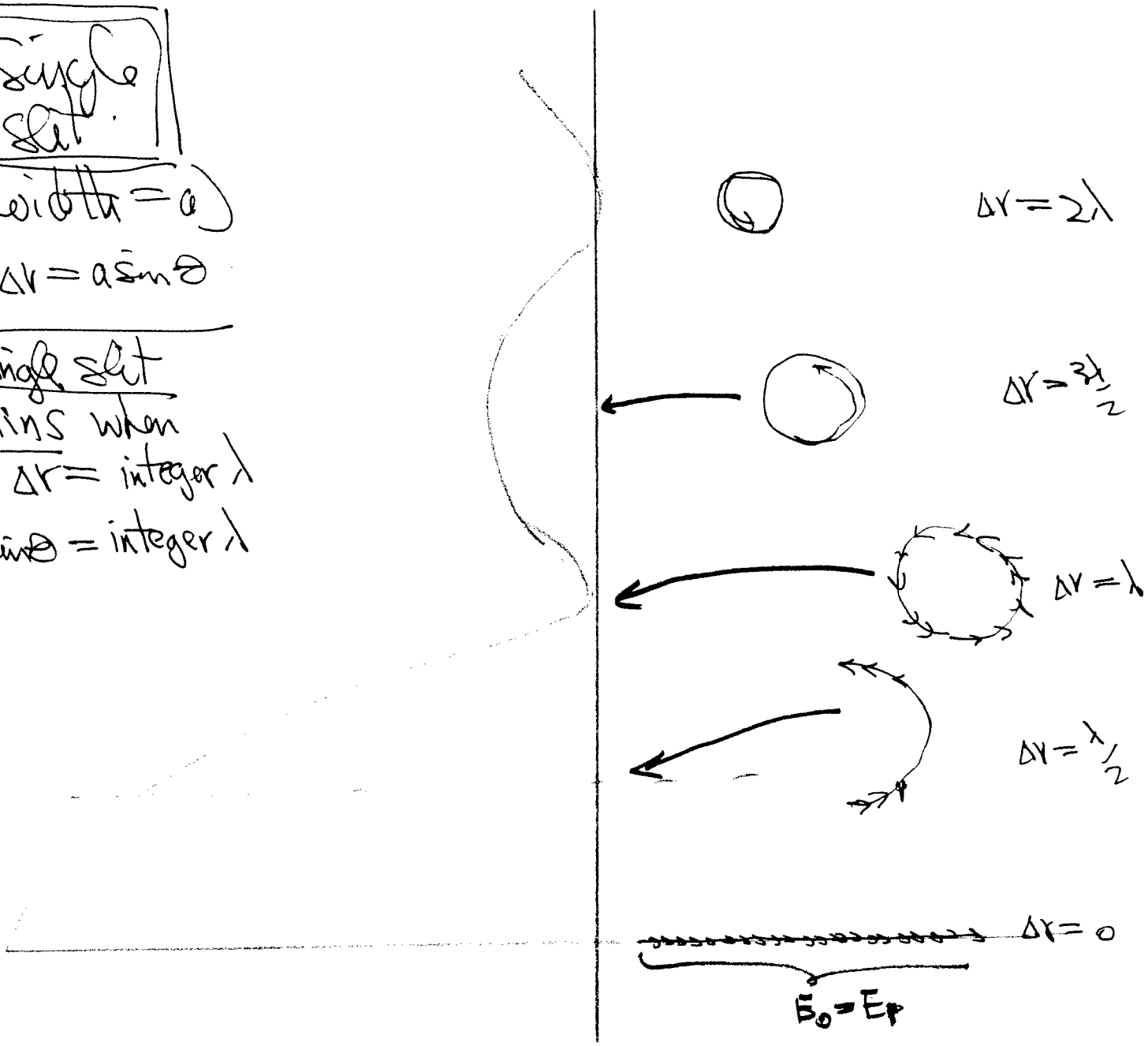
$\Delta r = a \sin\theta$

Single slit

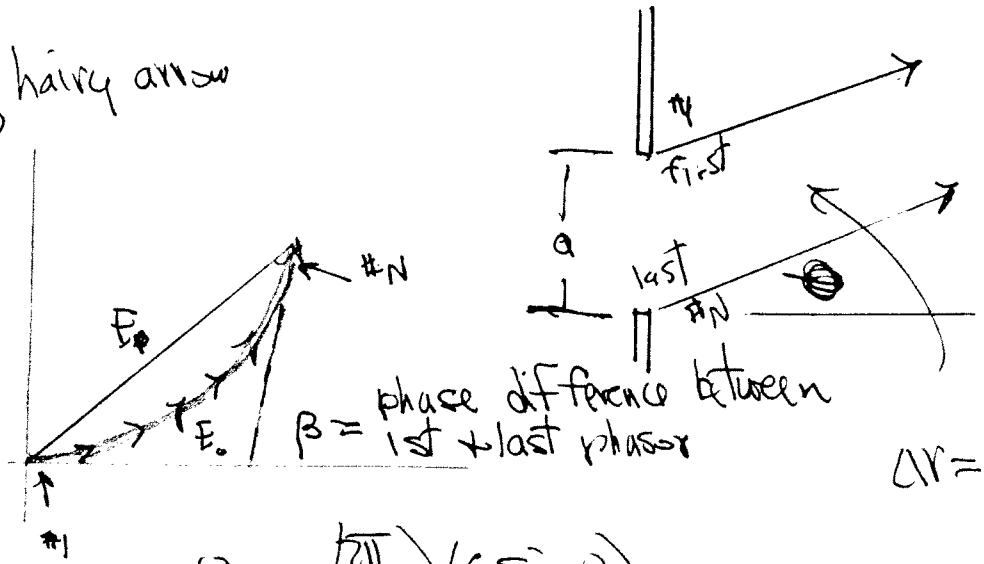
mins when

Δr = integer λ

$a \sin\theta$ = integer λ



E_0 = length of hairy arrow



β = phase difference between 1st + last phasor

$\Delta r = a \sin\theta$

$$\beta = \left(\frac{2\pi}{\lambda}\right)(a \sin\theta)$$

N-slit grating

$\Delta r = d \sin\theta$

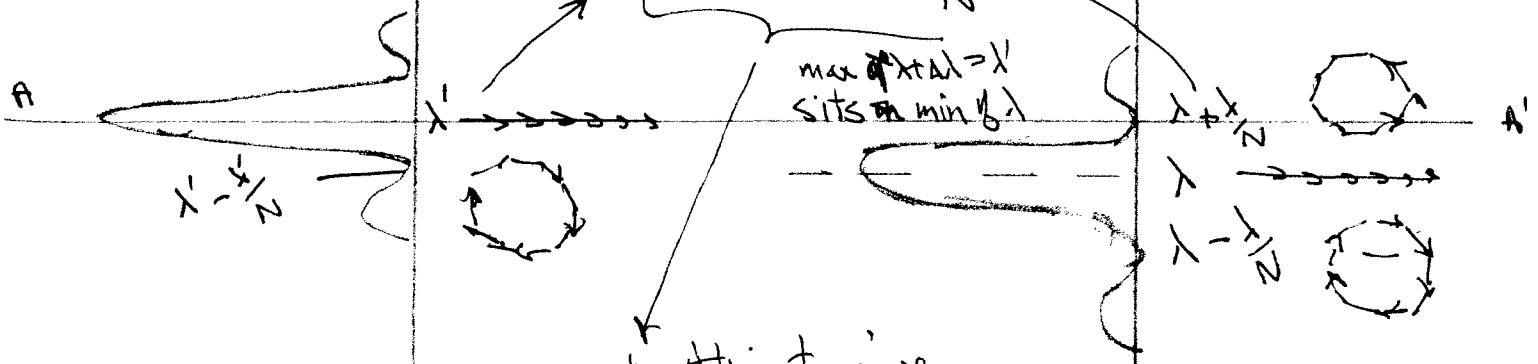
$R = \frac{\lambda}{\Delta\lambda}$

Max's + resolving power R

Barely resolved if max of one pattern falls on min of the other pattern. (Rayleigh criterion)

At AA' it's the same angle so

$\lambda' = \lambda + \Delta\lambda = \lambda + \frac{\lambda}{N}$



solve this to give

$R = \frac{\lambda}{\Delta\lambda} = N$

Resolving power in 1st order (grating of N slits)

$\lambda' = \lambda + \Delta\lambda$