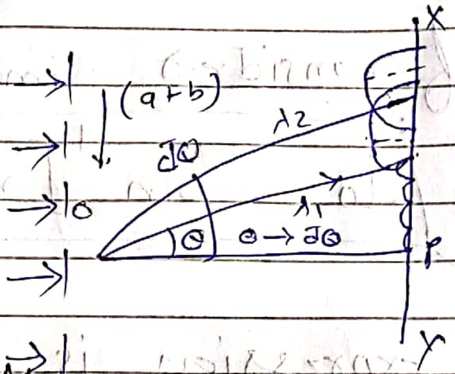
Resolving power of a grating → The resolving power of a diffraction grating is define as its ability to show two neighbouring lines in the spectrum as saprate and is mean by $\frac{\lambda}{d\lambda}$

λ is wavelength if any spectral light line and $d\lambda$ is diff of wavelength of 2 lines.

The condition for nth central (principal) max for wavelength λ is



$(a+b) \sin\theta = n\lambda_1$

multiplying both side by N

$N(a+b)\sin(\theta) = Nn\lambda_1$ — ①

The condition for first minimum for λ_1 is

$N(a+b)\sin(\theta + d\theta) = m\lambda_1$ — ②

where $m = 1, 2, \ldots, nN-1, nN+1, \ldots$

$m \neq N, 2N, 3N, \ldots$

$N(a+b)\sin\theta = Nn\lambda_1$ — ①

$N(a+b)\sin(\theta + d\theta) = m\lambda_1$ — ② $m = 1, 2, 3$

Let $m = nN + 1$ — ③

using ③ and ②

$N(a+b)\sin(\theta + d\theta) = (nN+1)\lambda_1$ — ④

The condition for nth central maxima of λ_2

$(a+b) \sin(\theta + d\theta) = n\lambda_2$ $n = 0, 1, 2$

multiplying both side by N

$N(a+b) \sin(\theta + d\theta) = Nn\lambda_2$ — (5)

comparing (4) and (5)

$(nN+1)\lambda_1 = Nn\lambda_2$

Let $\lambda_1 = \lambda$, $\lambda_2 = \lambda + d\lambda$

$(nN+1)\lambda = Nn(\lambda + d\lambda)$

$nN\lambda + \lambda = Nn\lambda + Nnd\lambda$

$\lambda = Nnd\lambda$

$$\frac{\lambda}{d\lambda} = nN$$