For n^{th} order dark fringe the condition is

$$\frac{2x_n'd}{D} = (2n+1)\frac{\lambda}{2} \quad \therefore x_n' = \frac{D(2n+1)\lambda}{4d}$$

For $(n+1)^{th}$ order dark fringe distance from center is

$$x_{n+1}' = \frac{D[2(n+1)+1]\lambda}{4d}$$

Hence, distance between two dark fringes is

$$\gamma' = x_{n+1}' - x_n' = \frac{D[2(n+1)+1]\lambda}{4d} - \frac{D(2n+1)\lambda}{4d} = \frac{D\lambda}{2d}$$

So we can conclude that distance between two consequitive bright or dark fringes is independent of order number. Hence, all the bright or dark fringes are equally spaced.

<u>Change of phase by reflection: Stoke's law</u>

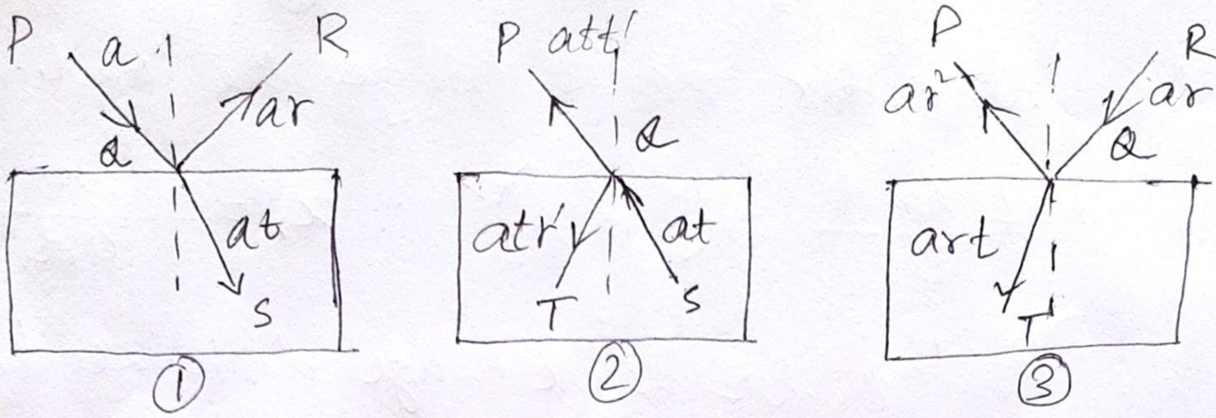
We know the coefficient of reflection γ

$$\gamma = \frac{\text{Amplitude of reflected wave}}{\text{Amplitude of incident wave}}$$

Coefficient of refraction 't' is

$$t = \frac{\text{Amplitude of refracted wave}}{\text{Amplitude of incident wave}}$$

Now we consider the incidence of light wave from rarer medium to denser medium. And the consider the reversal of light from denser ~~to~~ to rarer medium.



Let the amplitude of incident wave is a. If r and t is the reflection and transmission coefficients respectively, so the amplitude of QR wave is ar and amplitude of QS wave is at. If we reverse the refracted and reflected wave, we will get same amplitude along QP that is 'a'. Also, reversal of reflected and refracted light waves must produce no wave along QT. For reversal of refracted wave the amplitude along QT is atr' and along QP is att'. And for reversal of reflected wave the amplitude along QP is ar² and along QT is art. Therefore,

$$ar^2 + att' = a \quad \text{and} \quad art + ar't = 0$$

thus $\boxed{r' = -r}$ The negative sign in equation indicates a displacement in opposite direction that is equivalent to phase change π or path difference $\lambda/2$. Therefore, a phase change of π associated with reflection occurring at the interface when light propagates from denser to rarer medium. This is known as Stoke's law of reflection