

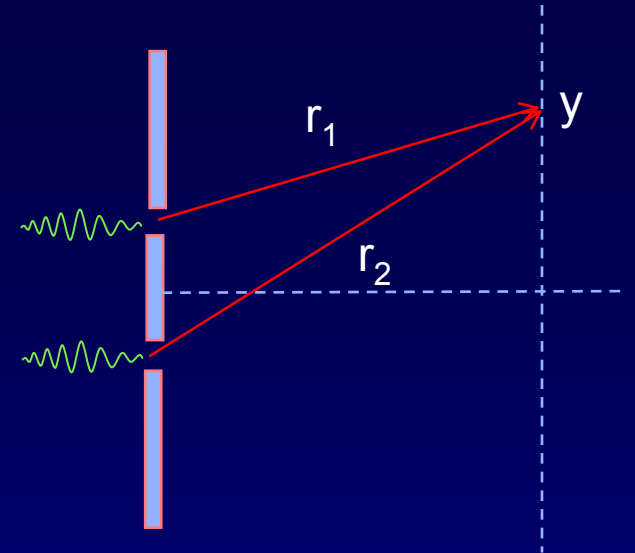
FYI: Two-Slit Experiment, More Carefully

ψ_1 : amplitude to pass through upper slit, and travel to y

$$\psi_1 \sim e^{ikr_1}$$

ψ_2 : amplitude to pass through lower slit, and travel to y

$$\psi_2 \sim e^{ikr_2}$$



Assume that the only difference between ψ_1 and ψ_2 is a result of the difference between r_1 and r_2 .

$$P = |\psi_1 + \psi_2|^2 \sim |e^{ikr_1} + e^{ikr_2}|^2 = (e^{+ikr_1} + e^{+ikr_2})(e^{-ikr_1} + e^{-ikr_2})$$

$$= e^{+ikr_1}e^{-ikr_1} + e^{+ikr_2}e^{-ikr_2} + e^{+ikr_1}e^{-ikr_2} + e^{-ikr_1}e^{+ikr_2}$$

$$= 1 + 1 + e^{+i\phi} + e^{-i\phi}$$

$$= 2 + 2\cos(\phi)$$

$$\phi = 2\pi \frac{r_1 - r_2}{\lambda} = kr_1 - kr_2$$