Phys 5B:

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- Light as a wave
  - Electromagnetic field Strength $E(x,t) = E_0 \sin(\mathrm{kx} - \omega t + \delta)$

    Fixed x: variation with ωt

    Two light waves 180^o out of phase, then

    $E_1 + E_2 = E_0 \sin(\omega t) + E_0 \sin(\omega t + \pi) = 0$ (destructive interference)

    If in phase:

    $E_1 + E_2 = E_0 \sin(\omega t) + E_0 \sin(\omega t + 2\pi) = 2E_0 \sin(\omega t)$ (Constructive interference)
  - Light from two slits:

    $y_{s_2 x} - y_{s_1 x} = \frac{\lambda}{2}$ path length difference

    Path length difference $(l >> d)$, $(\Theta_1 x \Theta_2) = d\sin\Theta = m\lambda$ Constructive interference

    $d\sin\Theta = \left(m + \frac{1}{2}\right)\lambda$
  - Example:

    3rd order fringe of 610nm light observed at angle of 28^o. How far apart are the slits?

    $d = \frac{m\lambda}{\sin\Theta} = \frac{3(630\,10^{-9}m)}{\sin 28^o} = 3.9x10^{-6}m$
  - Example with screen with l=1m
- $m = \frac{d\sin\Theta}{\lambda}$