

# Interference

The superposition of two or more waves.

Constructive

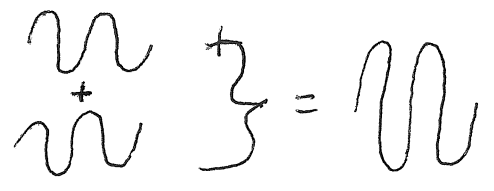
⇒ Resulting waveform is amplified

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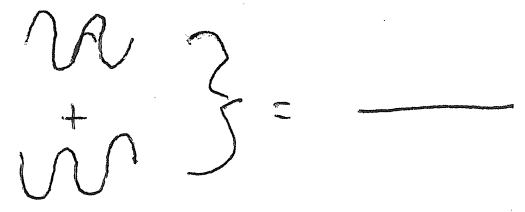
Destructive

⇒ Resulting waveform is destroyed

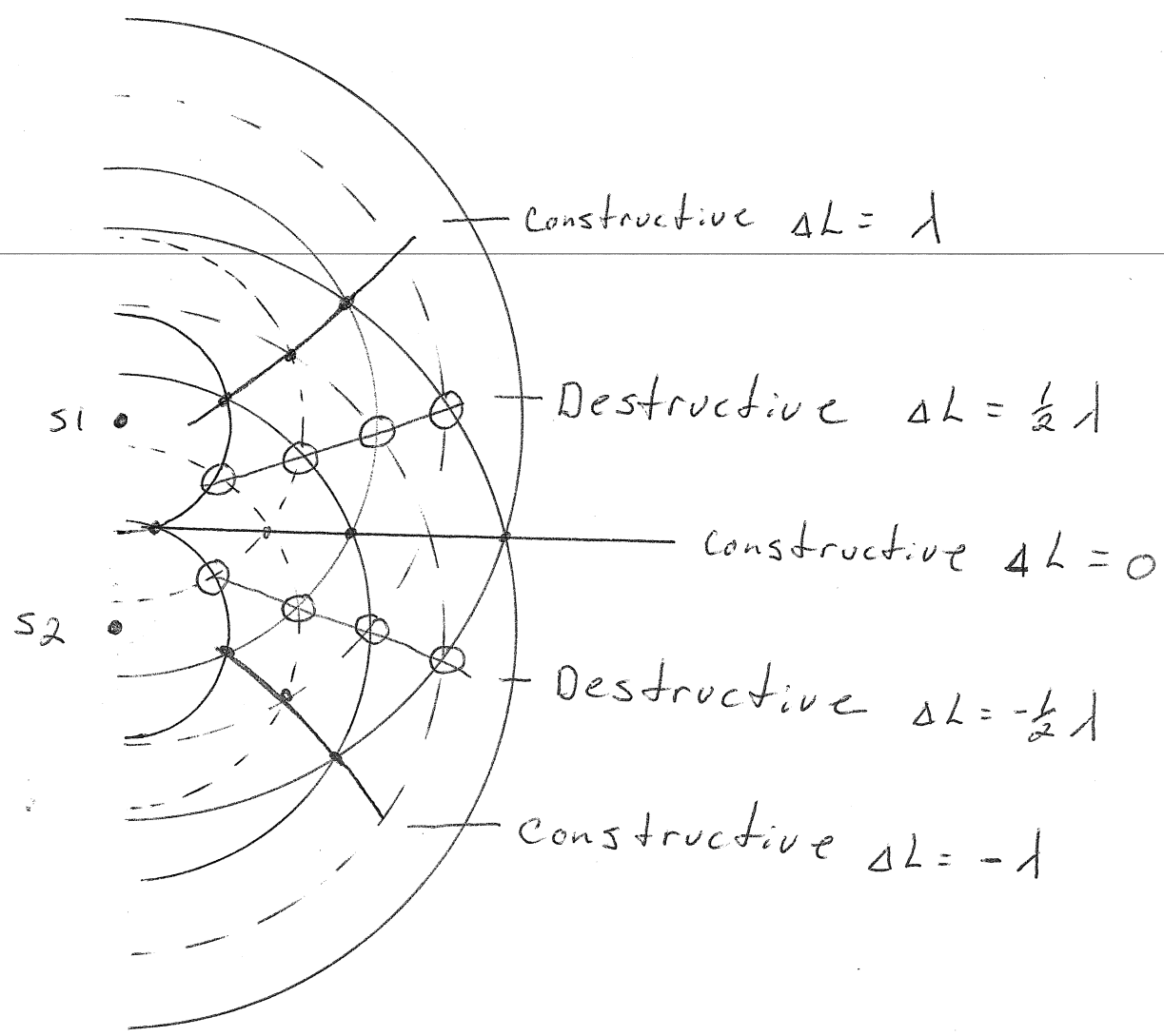
Total Constructive



Total Destructive

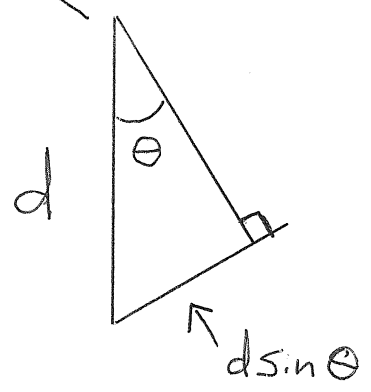
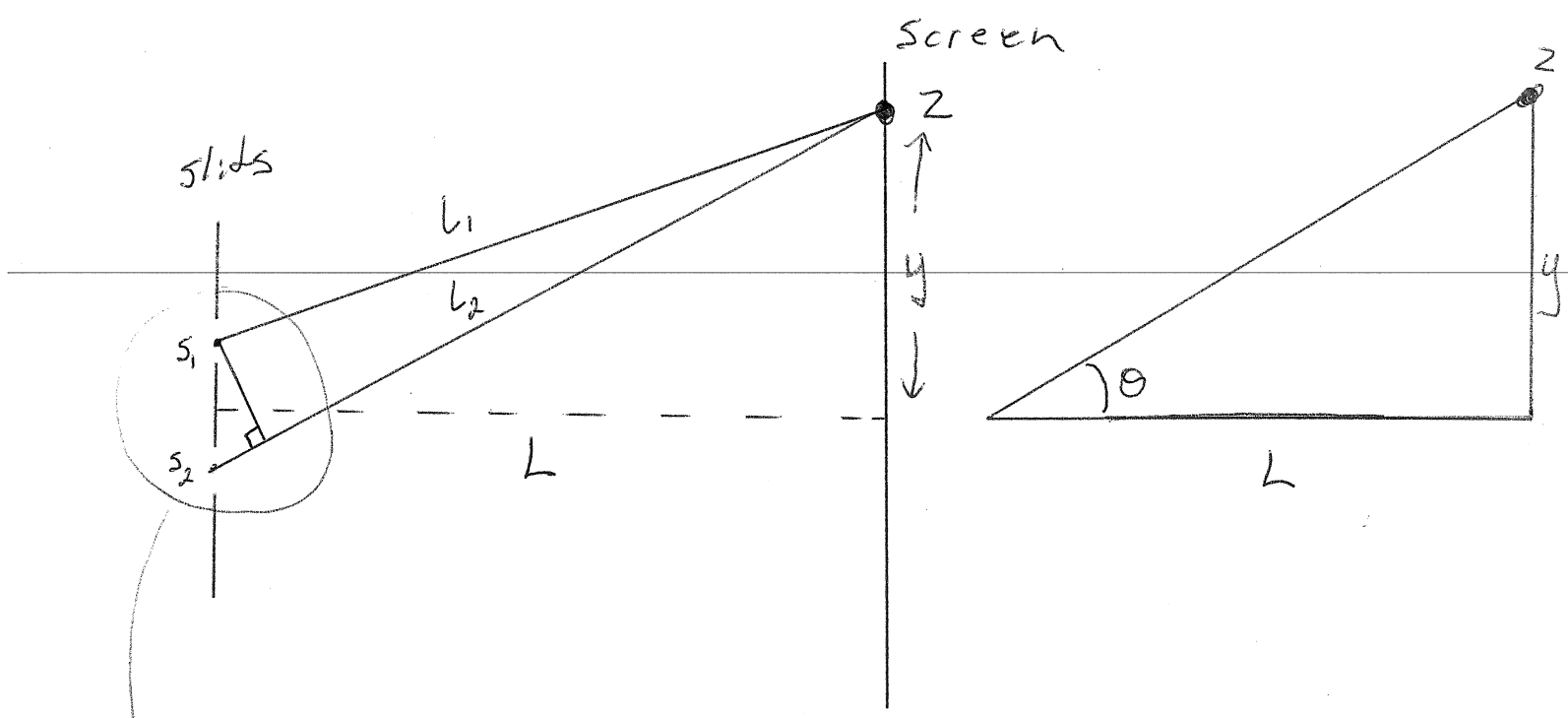


# Interference from Two Point Sources



$\Delta L = \text{path length difference}$

# Young Double slit Experiment



$d$  = slit separation  
 $L$  = distance to screen

Waves from slit 2 and slit 1  
 strike a point on the screen

if  $\Delta L = \frac{\lambda}{2}$  there is destructive interference

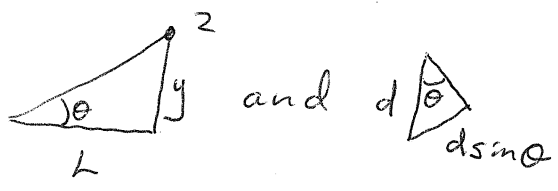
if  $\Delta L = \lambda$  there is constructive interference

For large distances (large  $L$ ) and small separation (small  $d$ )

$$\Delta L \sim d \sin \theta$$

and

Both  $\theta$  values are the same



Why?

As  $L$  is large and  $d$  is small  $L_1$  and  $L_2$  are nearly parallel.

Locating bright fringes (Constructive Interference)

$$\Delta L = d \sin \theta = m \lambda$$

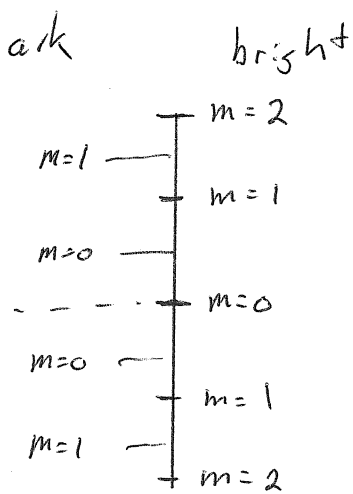


Any integer multiple of a wavelength will also produce constructive interference

To locate dark fringes (destructive Interference)

$$\Delta L = d \sin \theta = m \frac{\lambda}{2}$$

↑  
odd multiples will produce destructive interference



In this case dark fringes are numbered 0, 1, 2, ... from the central max.

$$\left(m + \frac{1}{2}\right) \lambda$$

$$\left(m - \frac{1}{2}\right) \lambda$$

In this case dark fringes are numbered 1, 2, 3, ... from the central maximum

