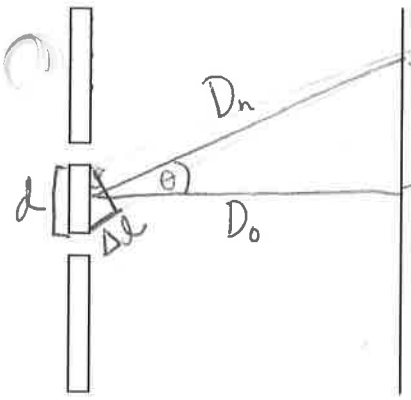
The Fringe Equations



Constructive Interference

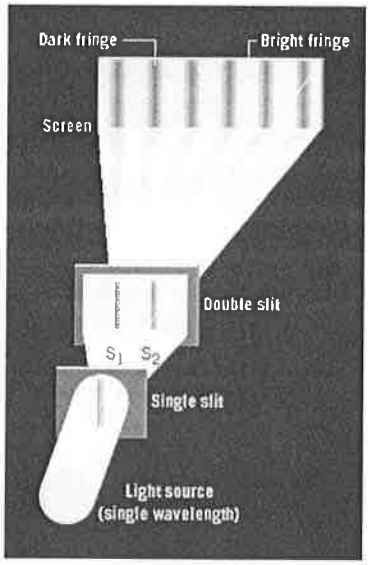
$$\sin\theta = \frac{n\lambda}{d} = \frac{x_n}{D_n}$$

Destructive Interference

$$\sin\theta = \frac{(n+\frac{1}{2})\lambda}{d} = \frac{x_n}{D_n}$$

Variable:	x	θ	D	d	λ
Quantity:	linear displacement from central max	angular displacement from central max	distance between sources and screen	distance between wave sources	wavelength
Units:	m	degrees or radians	m	m	m

Thomas Young's Double Slit Diffraction



In 1801 the English scientist Thomas Young (1773–1829) performed an historic experiment that demonstrated the wave nature of light by showing that two overlapping light waves interfered with each other.

Importance of experiment:

1. demonstrated light acts like a wave
2. first measurement of wavelength of light

What is the reason for first having a single and then a double slit?

The single slit acts as a point source to ensure that the waves from the double slits are coherent.

In a double slit experiment, light whose wavelength is 6.0×10^{-7} m is shone through two slits that are 0.10 mm apart onto a screen that is 2.5 m away. What is the distance between the central maximum and the first bright band?

$n = 1$

$$\frac{x_n}{D_n} = \frac{n\lambda}{d}$$

$$x_n = \frac{(1)(6.0\times10^{-7}\text{m})(2.5\text{m})}{(1.0\times10^{-4}\text{m})} = 0.015\text{m}$$

Note: $D_0 + D_1$ virtually the same for small x separation