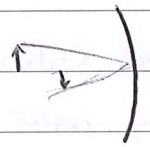
Optics Revision

total internal reflection

the mirror equation /lens $\boxed{\frac{1}{u} + \frac{1}{v} = \frac{1}{f}}$, where $f = \frac{R}{2}$

- sign convention

Ray tracing & magnification $M = \frac{y'}{y} = -\frac{v}{u}$



Lens Maker's equation $\frac{1}{u} + \frac{1}{v} = (n-1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

* practice ray tracing

diverging / converging lenses - virtual / real images

combinations of lenses - equivalent lens formula

age - near point = 250 mm $M = -\frac{250}{f}$

- the microscope $M = -\frac{150}{f_1}\frac{250}{f_2}$
- the telescope $M_{ang} = -f_1/f_2$

Polarisation - Malus' Law
- right / left

Huggens principle / Fermat principle

Young's slits $I(\theta) = 4 I_0 \cos^2\left(\frac{kd}{2}\sin\theta\right)$ separation d

S_0 limit on size

Single slit diffraction - Fraunhofer diffraction FT relationship

Young's slits with finite width.

Far field diffraction pattern of a grating $I = I_0 \frac{\sin^2\beta}{\beta^2} \frac{\sin^2\left(\frac{N\delta}{2}\right)}{\sin^2\left(\frac{\delta}{2}\right)}$

Spectroscopy $R = \frac{\lambda}{d\lambda} = Nm$

- Rayleigh Criterion
- resolving power

Diffraction in 2D - Airy pattern $\theta = \frac{1.22\lambda}{D}$ ← diameter

centre to 1st min

- diffraction is the limiting factor (telescopes have large apertures)

Michelson interferometer.

$d\sin 2\theta$ formula

Thin film optics

anti reflection $n = \sqrt{n_{sub}}$ (greater wave)

high reflection $n > n_{sub}$ (greater wave)

Laser - gain - stimulated emission and population inversion
- seedback - modes

Holography - recording amplitude and phase information

- three transmitted waves and their properties

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