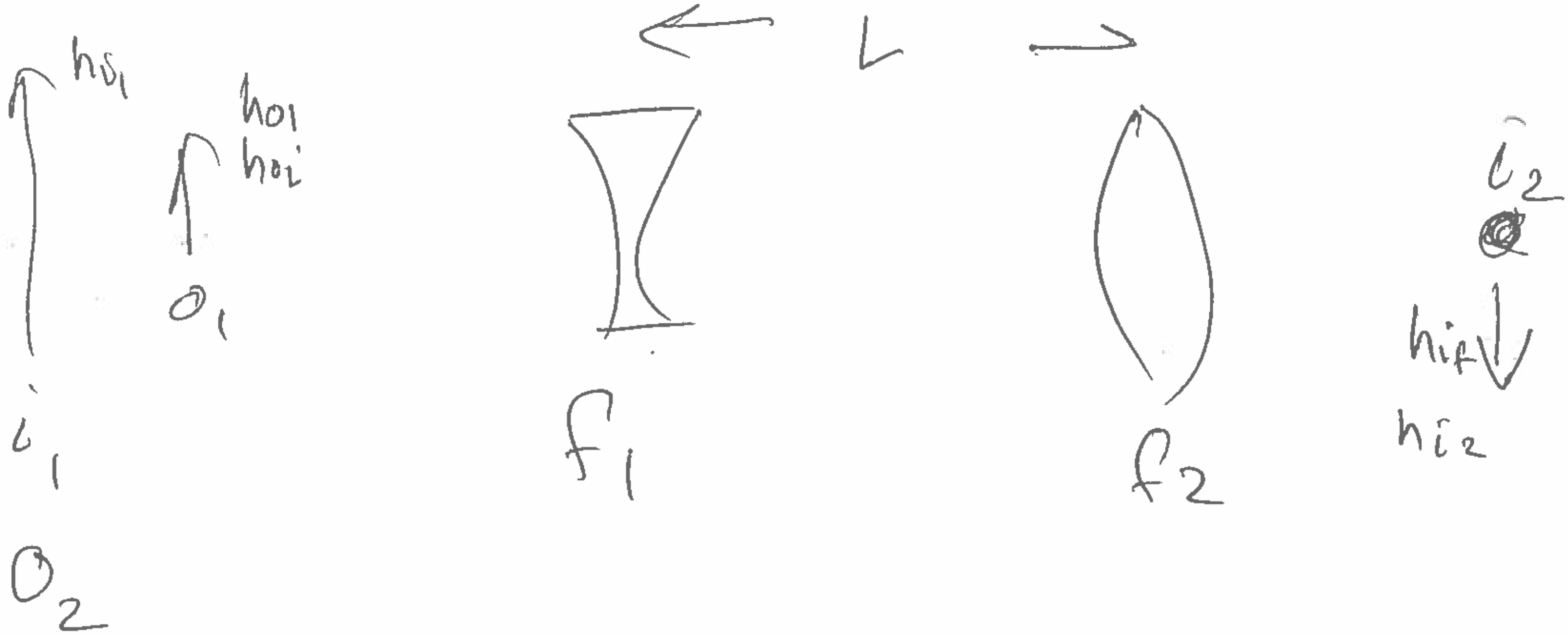


$$\frac{1}{i_1} = \frac{1}{f_1} - \frac{1}{o_1} = \frac{1}{-O} - \frac{1}{o_1}$$

$$O_2 = L - i_1 = L - (- \quad)$$

$$\frac{1}{i_2} = \frac{1}{f_2} - \frac{1}{O_2}$$

$$M = \frac{h_i}{h_o} = \frac{-i}{O}$$

$$M_T = \left(-\frac{i_1}{o_1}\right)\left(-\frac{i_2}{o_2}\right)$$

$$M_T = M_1 M_2 \cdots M_n = \frac{h_{if}}{h_{oi}}$$

Sign Convention for optics

distances object, image

$\text{dist} > 0 \Rightarrow$ Real

$\text{dist} < 0 \Rightarrow$ virtual

focal lengths

$f > 0 \Rightarrow$ concave mirrors, converging lens

$f < 0 \Rightarrow$ convex mirror, diverging lens

heights

$h > 0 \Rightarrow$ upright ↑

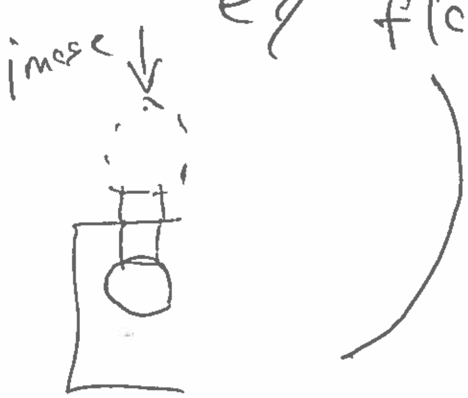
$h < 0 \Rightarrow$ inverted ↓

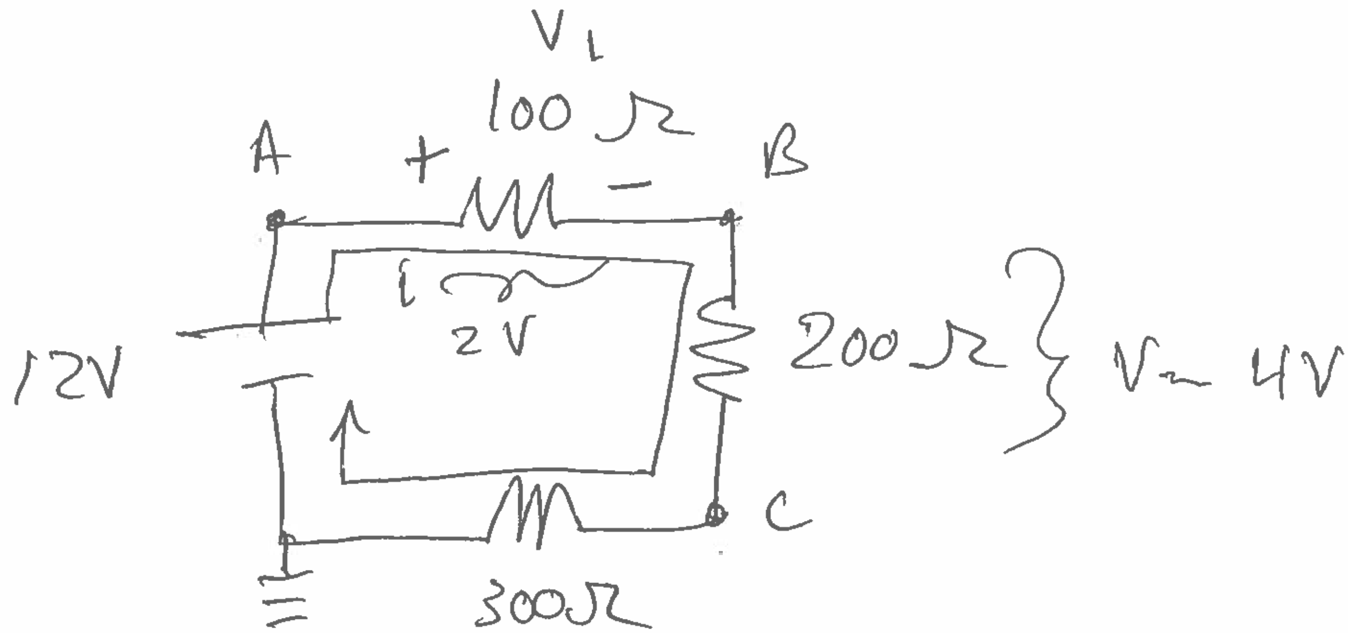
A real image is an image in which light rays actually focus in space creating an image which can be viewed by all without having to look at the optical element creating it.

eg/ Projection on a movie screen

A virtual image is an image in which light rays do not actually focus in space. The image only appears when viewed by the optical element creating it.

eg/ flat mirrors.





$$i_{TOT} = \frac{V_{TOT}}{R_{TOT}} = \frac{12V}{100\,\Omega + 200\,\Omega + 300\,\Omega} = \frac{12V}{600\,\Omega}$$

V_3 6V

$$i_{TOT} = 2 \times 10^{-2} A$$

$$V_A = 12\,V$$

$$V_1 = i R_1 = (2 \times 10^{-2} A)(100\,\Omega)$$

10^2

$$V_1 = 2V$$

$$V_B = 10V$$

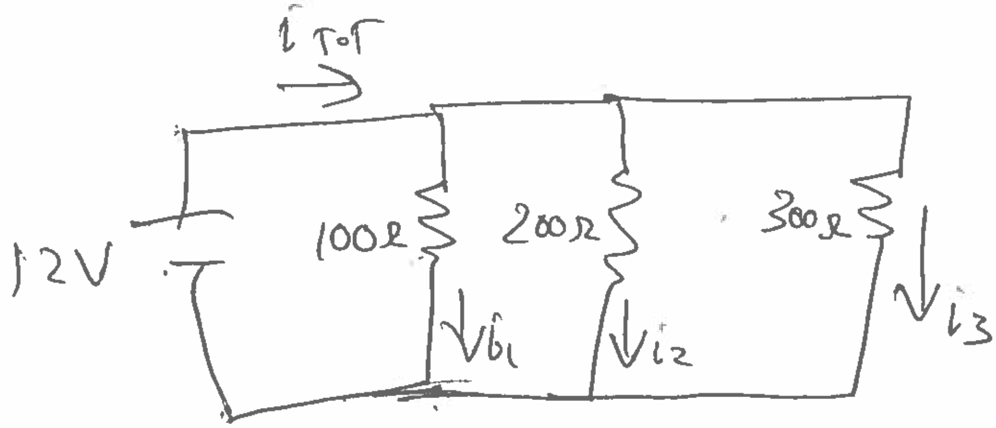
$$V_2 = iR_2 = (2 \times 10^{-2} A)(200 \Omega)$$

$$= 4 V$$

$$V_C = 6 V$$

$$V_3 = iR_3 = (2 \times 10^{-2} A)(300 \Omega)$$

$$= 6 V$$



$$V_{100\Omega} = \underline{12V} = V_{200\Omega} = V_{300\Omega}$$

$$i_{TOT} = i_1 + i_2 + i_3$$

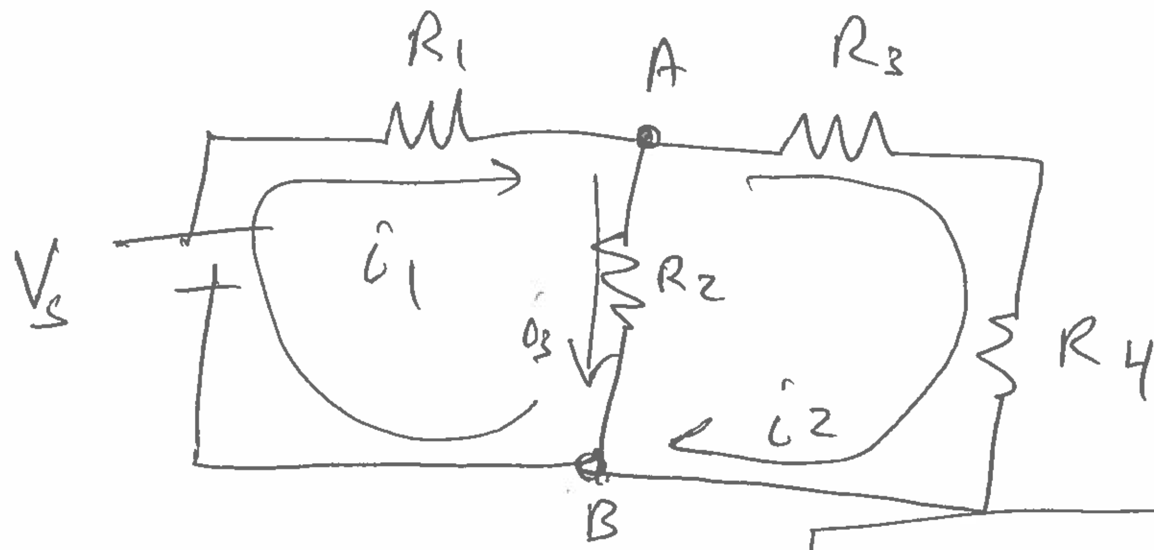
$$i_1 = \frac{12V}{100\Omega} = .12\ A$$

$$i_2 = \frac{12V}{200\Omega} = .06\ A$$

$$i_3 = \frac{12V}{300\Omega} = .04\ A$$

$$i_{TOT} = .12A + .06A + .04A$$

$$\boxed{= .22\ A}$$



AT A $\sum i = 0 \Rightarrow$ $i_1 = i_2 + i_3$

Left
Let loop start at A walk CW

$$-i_3 R_2 + V_s - i_1 R_1 = 0$$

Loop at A Right loop CW

$$-i_2 R_3 - i_2 R_4 + i_3 R_2 = 0$$

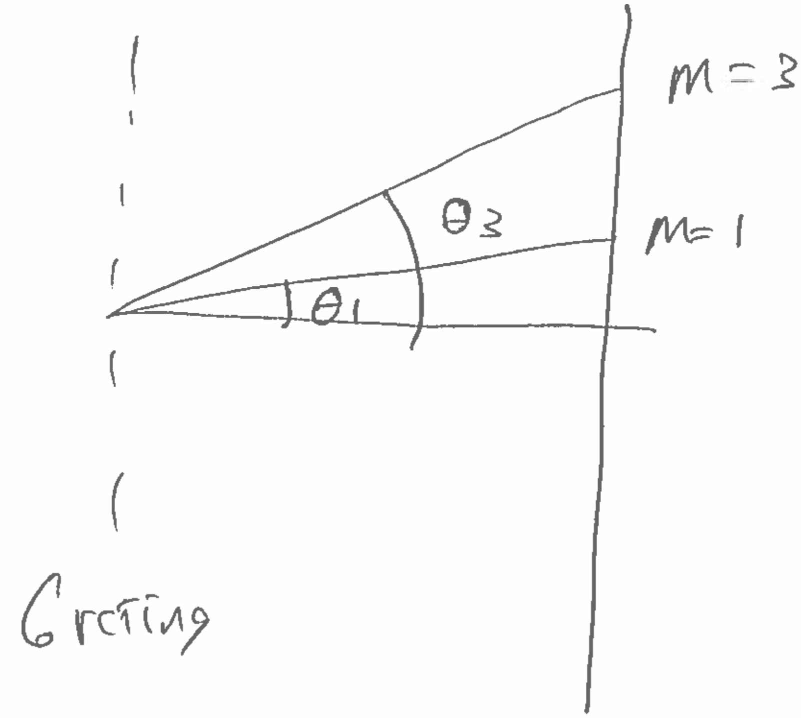
$V_{A \to B} = -i_3 R_2$

or $V_{A \to B} = -i_2 R_3 - i_2 R_4$ } same

27-48

$\theta_1 = 18.0^\circ$

$\theta_3 = ?$



$d\sin\theta = m\lambda$ for max of Diffraction Grating

$d\sin\theta_1 = \lambda$ m=1

$d\sin\theta_3 = 3\lambda$

$$\frac{d\sin\theta_3 = 3\lambda}{d\sin\theta_1 = \lambda}$$

$\sin\theta_3 = 3\sin\theta_1$

$\theta_3 = \sin^{-1}(3\sin(18^\circ))$

$\theta_3 = 68.0^\circ$

27-49

$G = 2604 \text{ lines/cm} \qquad \theta_1 = 30.0°$

λ between 410 nm and 660 nm

what wavelengths produce that max

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

$$\lambda = \frac{d \sin\theta}{m}$$

$$\lambda = \frac{1}{m}\left[\left(\frac{10^{-2} m}{2604}\right) \sin(30°)\right] = \frac{1920 \text{ nm}}{m}$$

$m = 1 \Rightarrow \lambda = 1920 \text{ nm}$ Too large

$m = 2 \Rightarrow \lambda = 960 \text{ nm} \Rightarrow$ Too large

$m = 3 \Rightarrow \lambda = 640 \text{ nm}$ ✓

$m = 4 \Rightarrow \lambda = 480 \text{ nm}$ ✓

$m = 5 \Rightarrow \lambda = 384 \text{ nm} \Rightarrow$ Too small