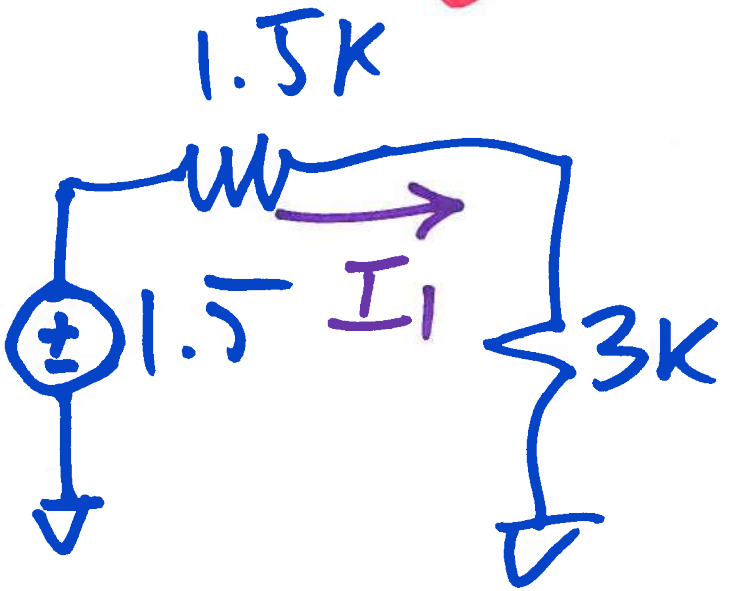
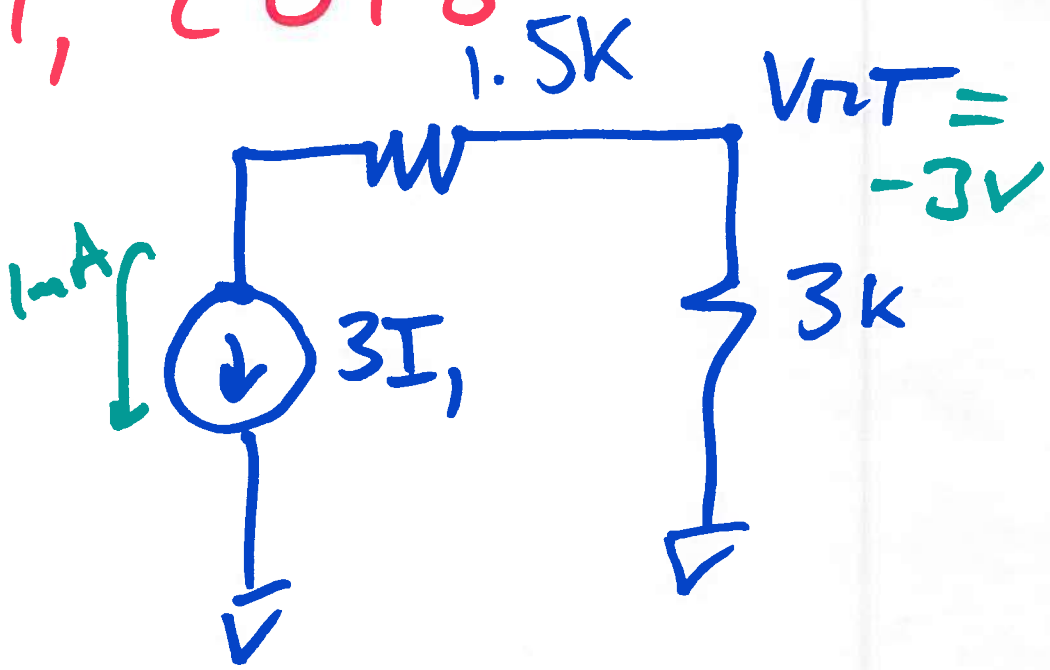
EE 220 circuits 1

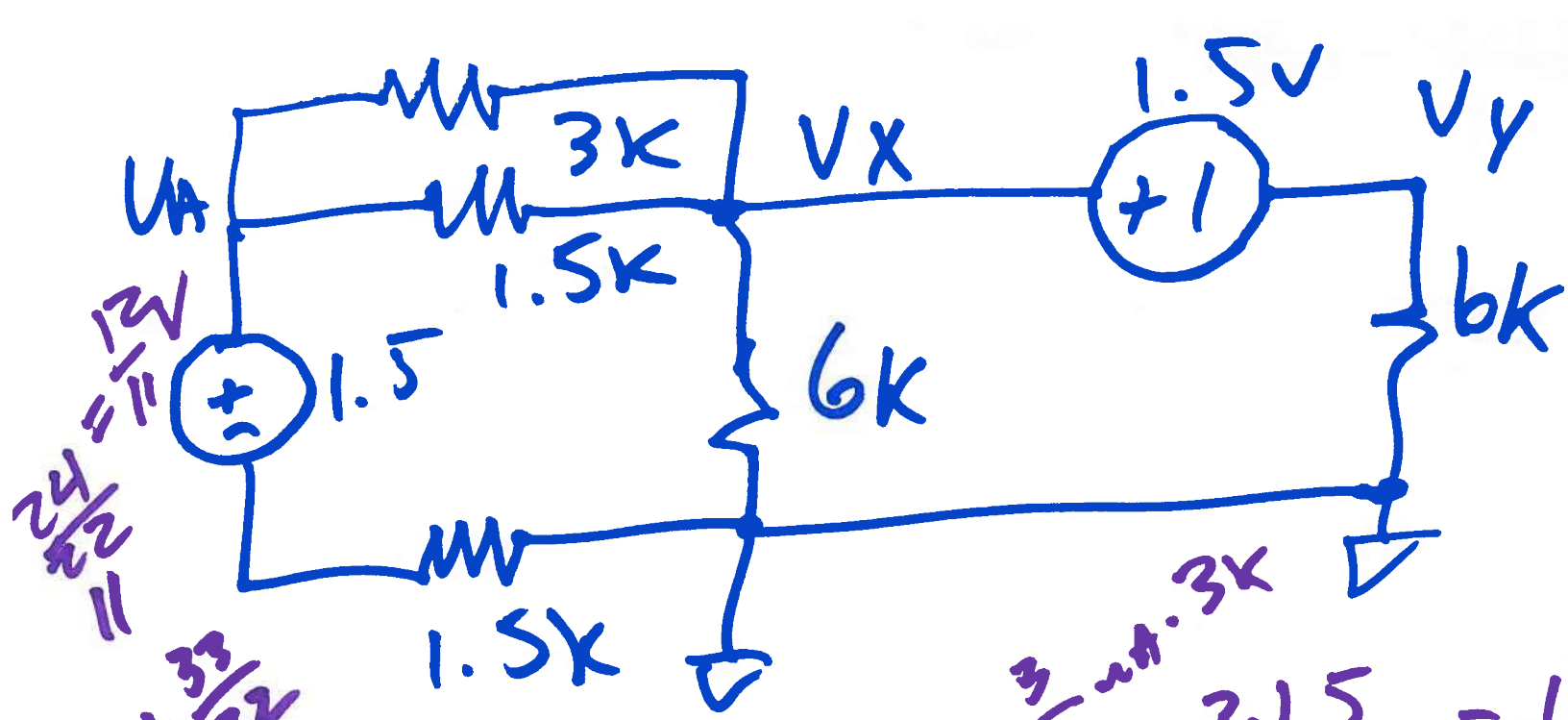
Lecture 11

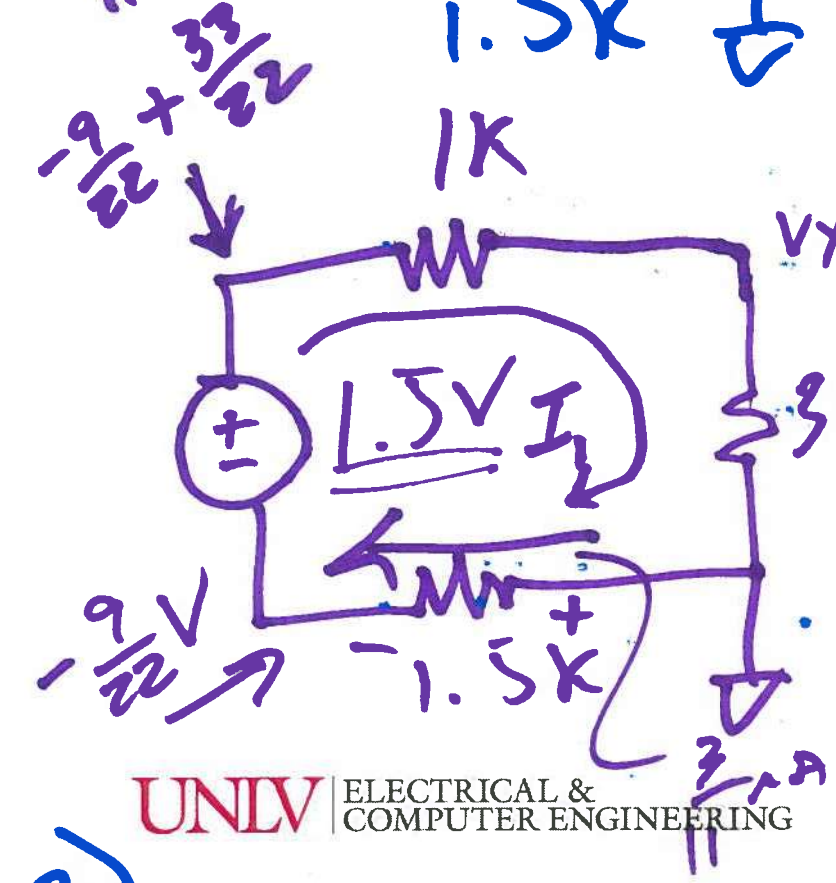
Oct. 1, 2018





$$I_1 = \frac{1.5}{4.5K} = \frac{1}{3}mA$$



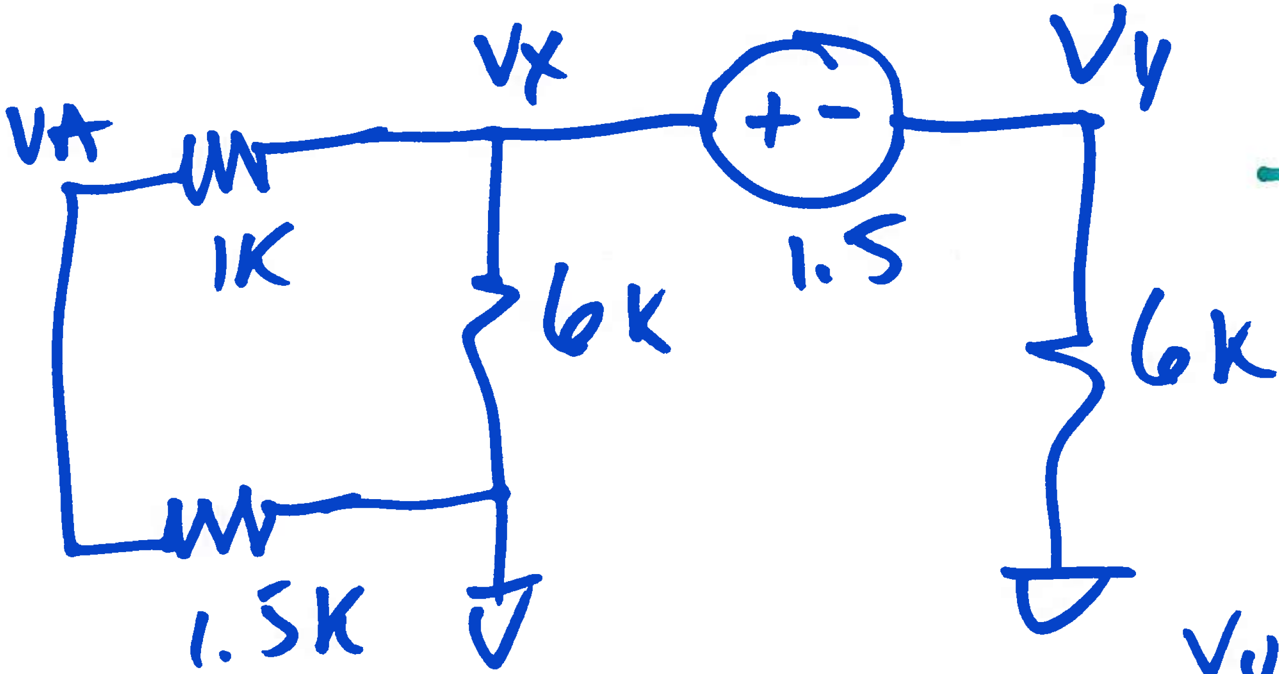


$$V_x, V_y = \frac{3}{11}\text{mA} \cdot 3\text{K} \qquad \frac{3 \cdot 1.5}{3+1.5} = 1\text{K}$$

$$= \frac{9}{11}\text{V}$$

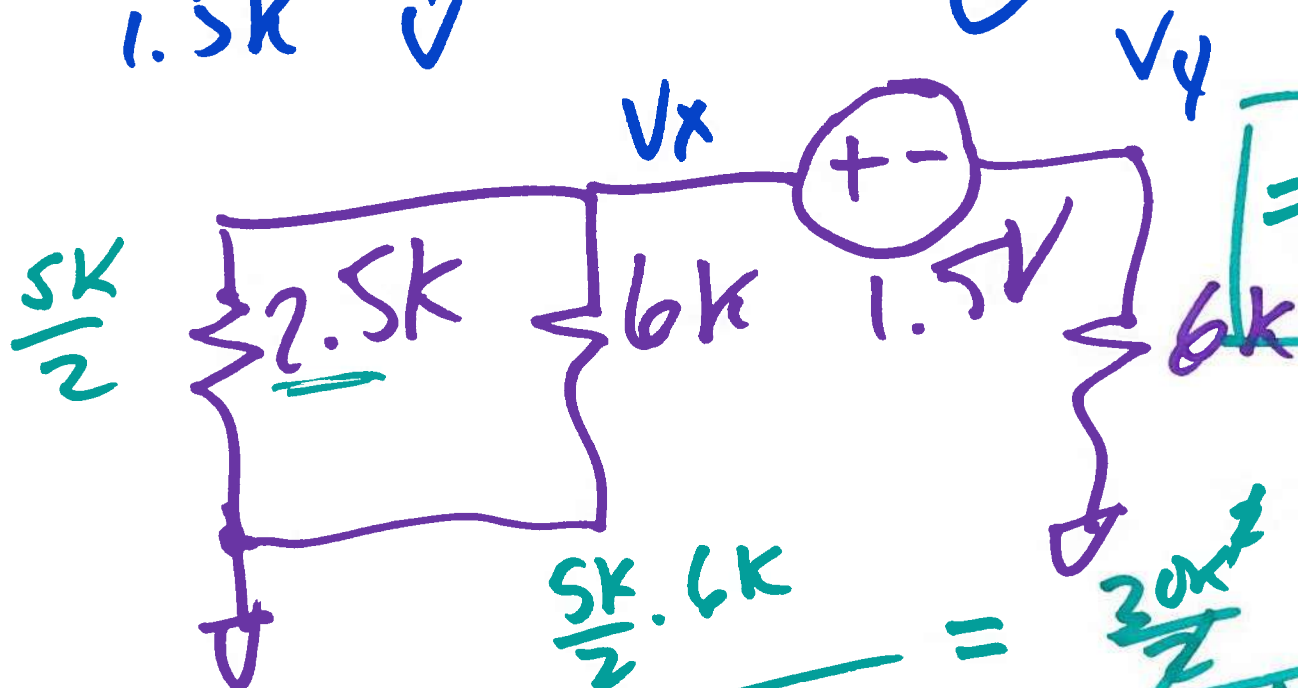
$$I_1 = \frac{1.5}{5.5\text{K}} = \frac{3}{11}\sim\text{A}$$

2)



$$\frac{\frac{5K}{2}\cdot 6K}{\frac{5K}{2}+\frac{12K}{2}} = \frac{\frac{30K}{2}}{\frac{17K}{2}}$$

$$= \frac{30}{17}K$$



$$\frac{\frac{5K}{2}\cdot 6K}{\frac{5K}{2}+\frac{12K}{2}} = \frac{\frac{30K}{2}}{\frac{17K}{2}}$$

$$\frac{\frac{30K}{2}}{\frac{22K}{2}}$$

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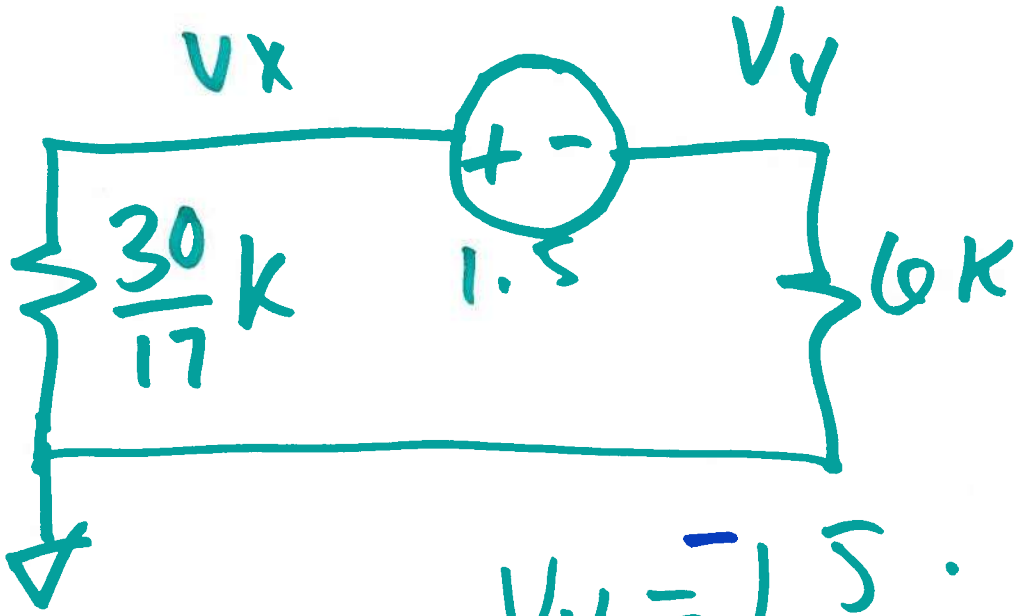
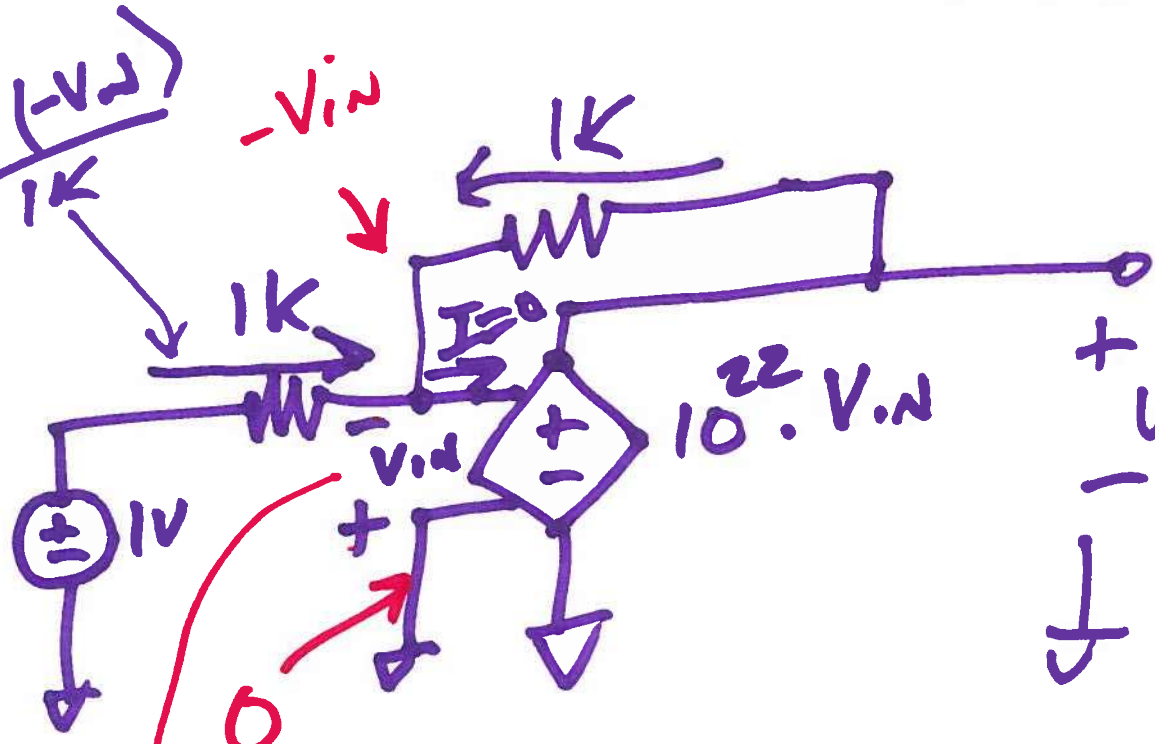
3)



$$V_y = -1.5 \cdot \frac{6k}{6k + \frac{30}{17}k}$$

$$V_x = V_y + 1.5$$



$V_{out} = 10^{22} \cdot V_{in}$

$V_{in} = \frac{V_{out}}{10^{22}}$

$0 - (-V_{in}) = V_{in}$

$V_{out} = -1V$

$$\frac{1 - (-V_{in})}{1K} + \frac{V_{out} - (-V_{in})}{1K} = 0$$

$$-1 = V_{out}\left(1 + \frac{2}{10^{22}}\right)$$

$$1 + V_{in} + V_{out} + V_{in} = 0$$

$$1 + 2V_{in} + V_{out} = 0$$

$$1 + \frac{2\,V_{out}}{10^{22}} + V_{out} = 0$$

5)

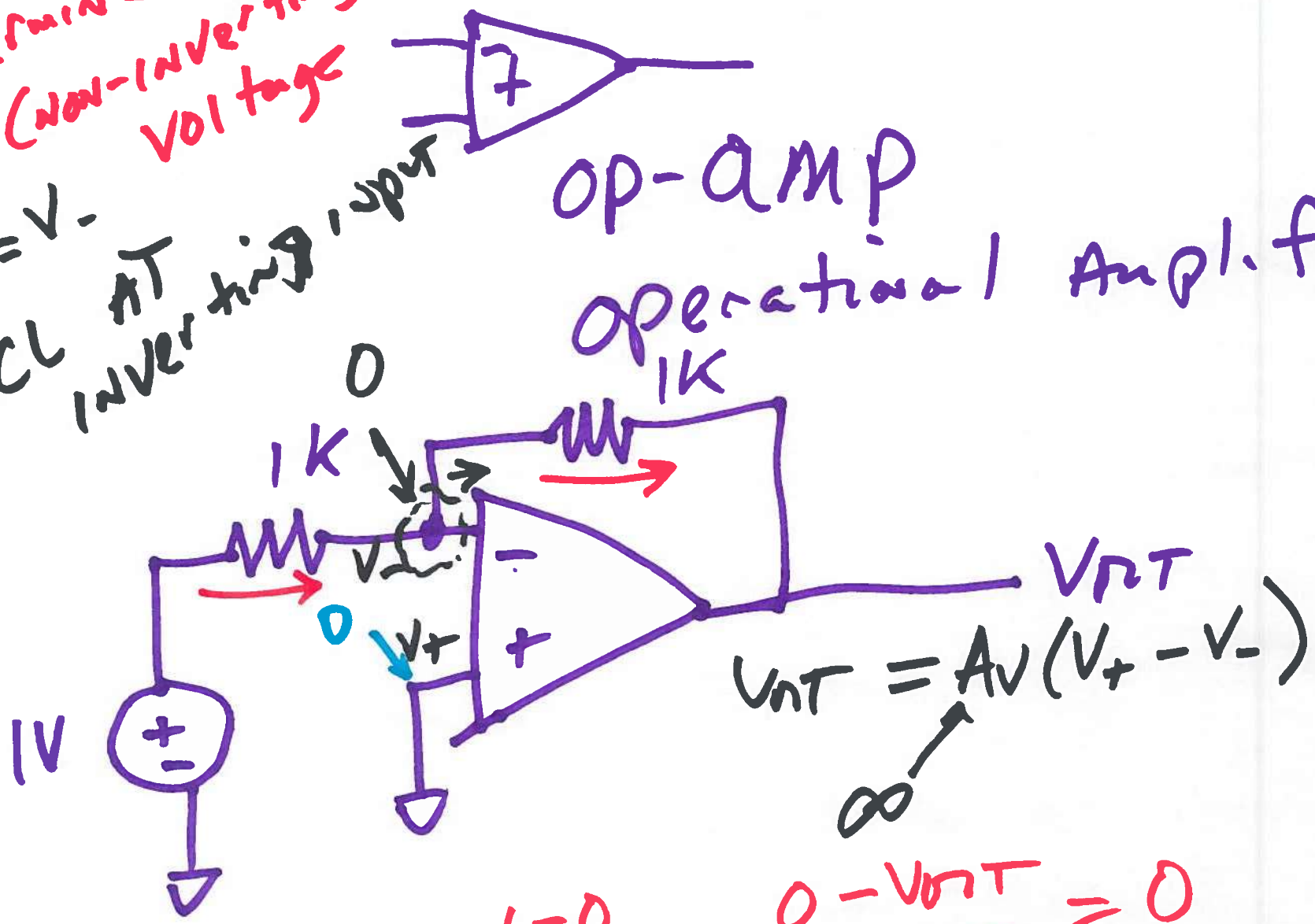
1) Determine + (non-inverting) voltage

2) $V_+ = V_-$

3) KCL at inverting input

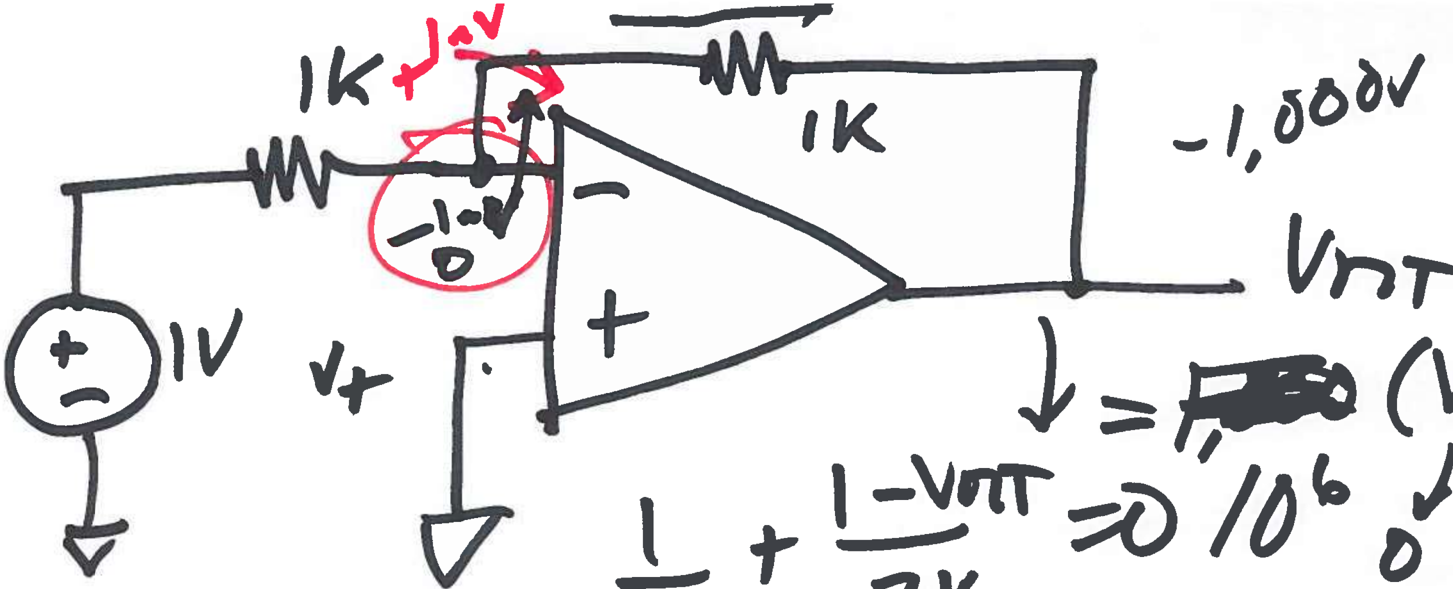
op-amp

operational Amplifier



$$\frac{1-0}{1K} - \frac{0-V_{OUT}}{1K} = 0$$

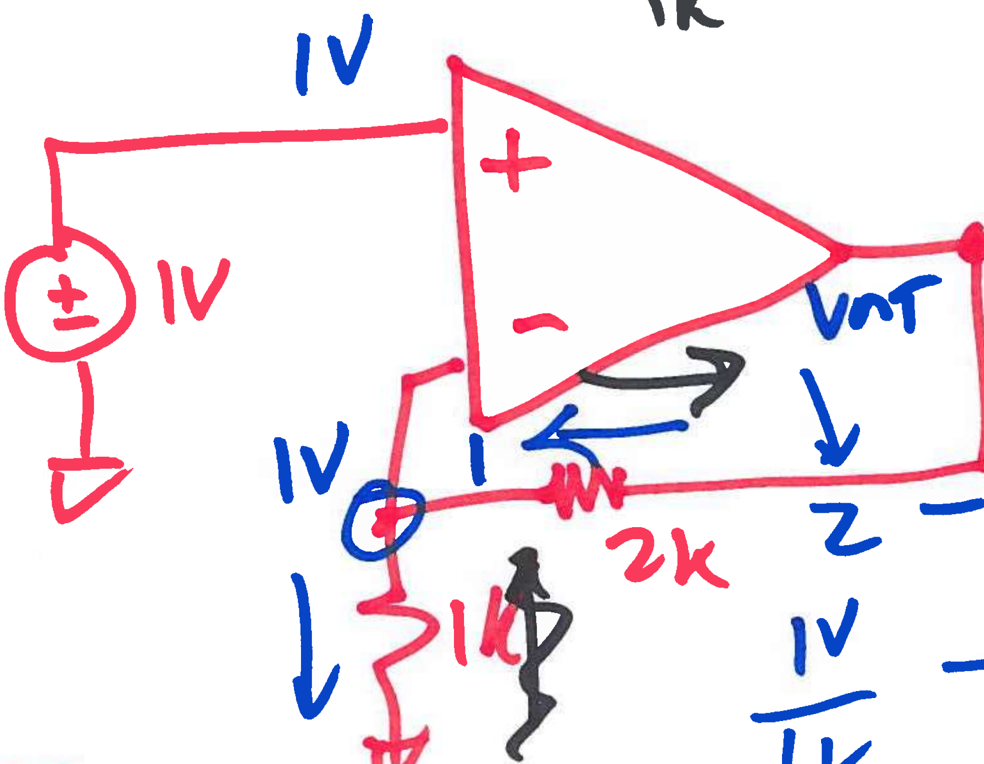
$$V_{OUT} = -1V$$



$$\downarrow = [redacted] (V_+ - V_-)$$

$$10^6 \quad 0 \quad - 1\mu V$$

$$\frac{1}{1K} + \frac{1 - V_{OUT}}{2K} = 0$$



0 − 1μV

$$V_{OUT} = 3V$$

$$2 - V_{OUT} + 1 = 0$$

$$\frac{1V}{1K} - \frac{V_{OUT} - 1}{2K} = 0$$