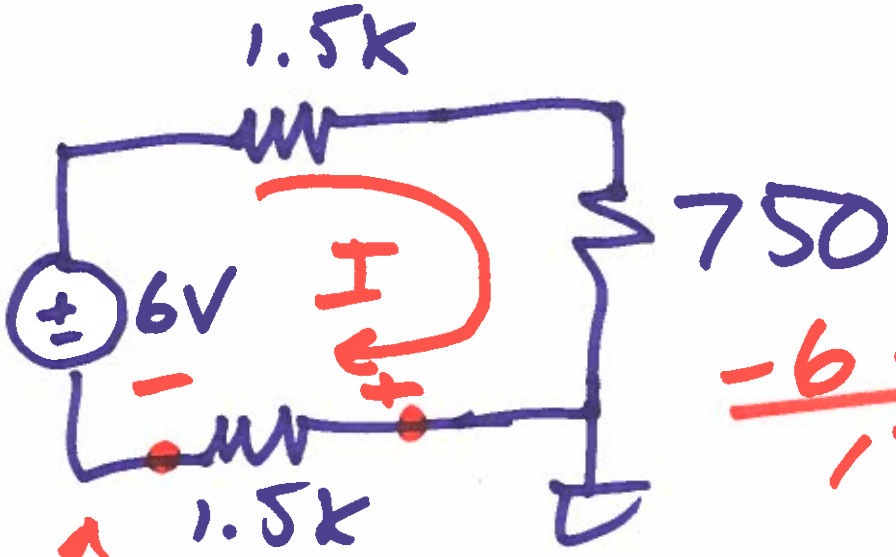
EE 220 Circuits 1

Lecture 12

Oct. 7, 2019

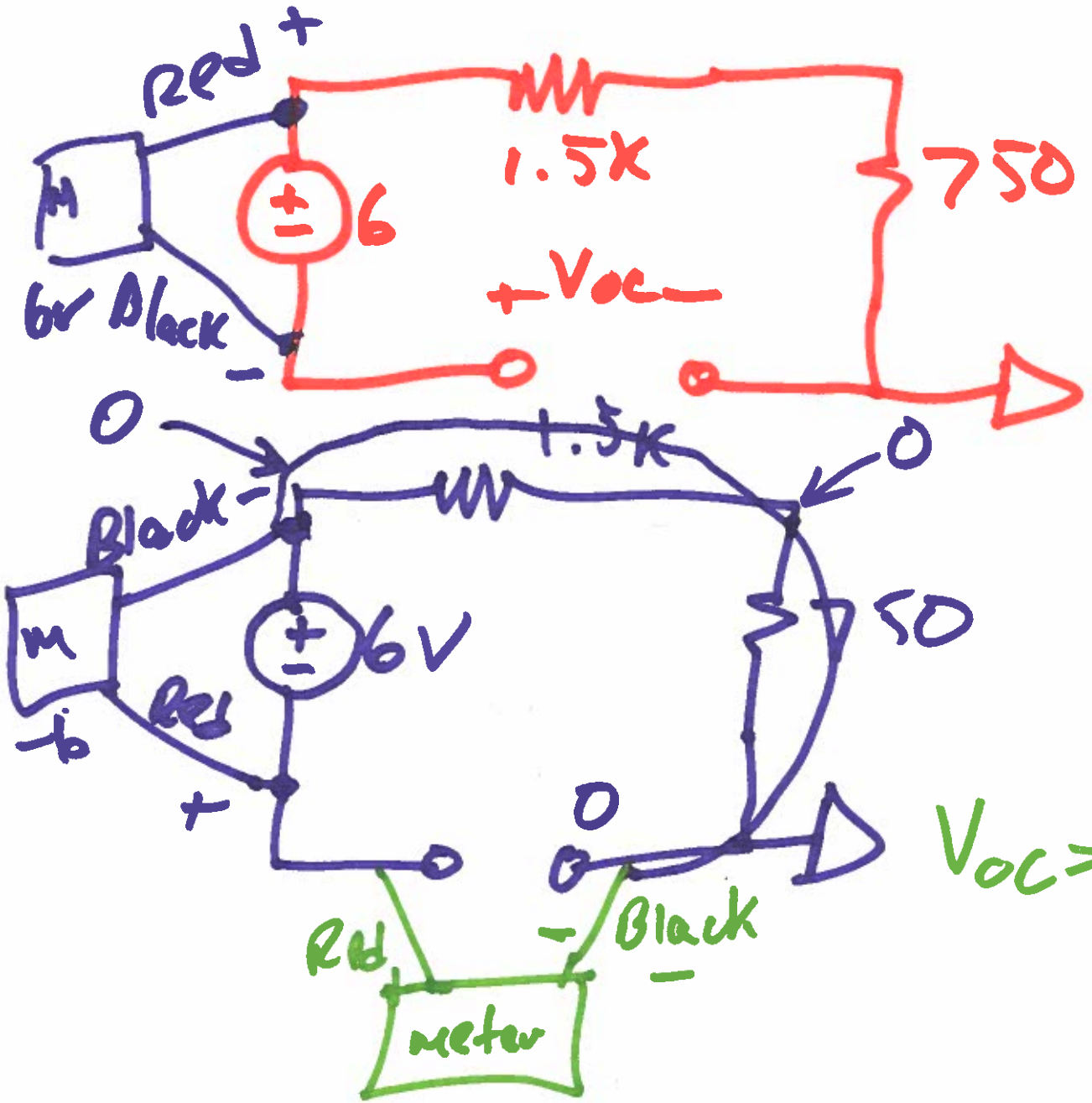


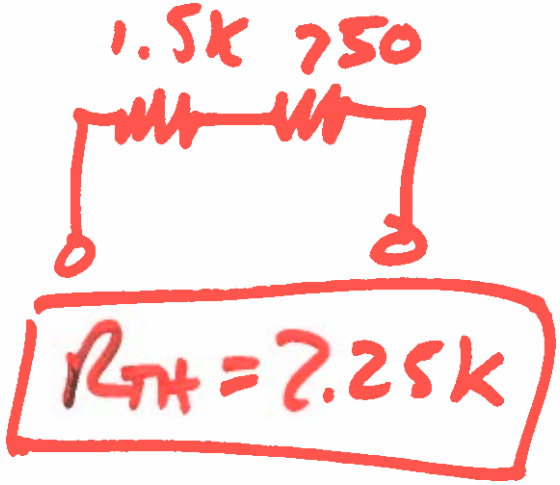
$$I = \frac{6}{1.5k + 750 + 1.5k}$$

$$\frac{-6 \cdot 6 \cdot 250}{15} - \frac{6 \cdot 3 \cdot 500}{8 \cdot 500}$$

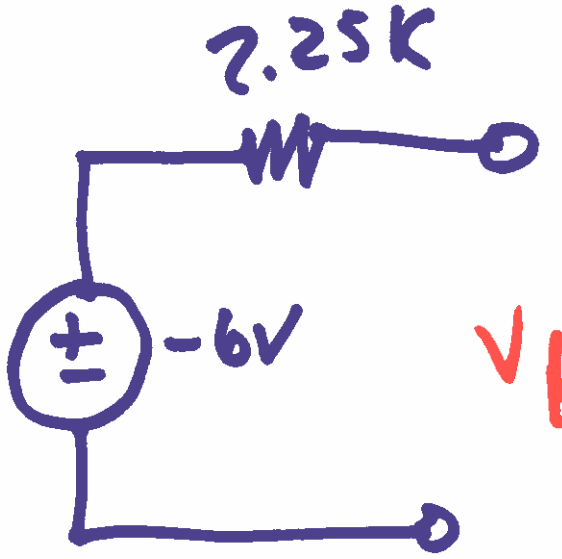
$$V_o = -1.5k \cdot I = \frac{-6 \cdot 1.5k}{1.5k + 750 + 1.5k}$$

$$V_o = -\frac{36}{15} = -\frac{12}{5} = -2.4V$$


Red +
1.5K
750
6
+ Voc -
for Black -
0
1.5K
Black -
0
6V
50
Red
+
0
Red
- Black
meter


1.5K 750
$R_{TH} = 2.25K$

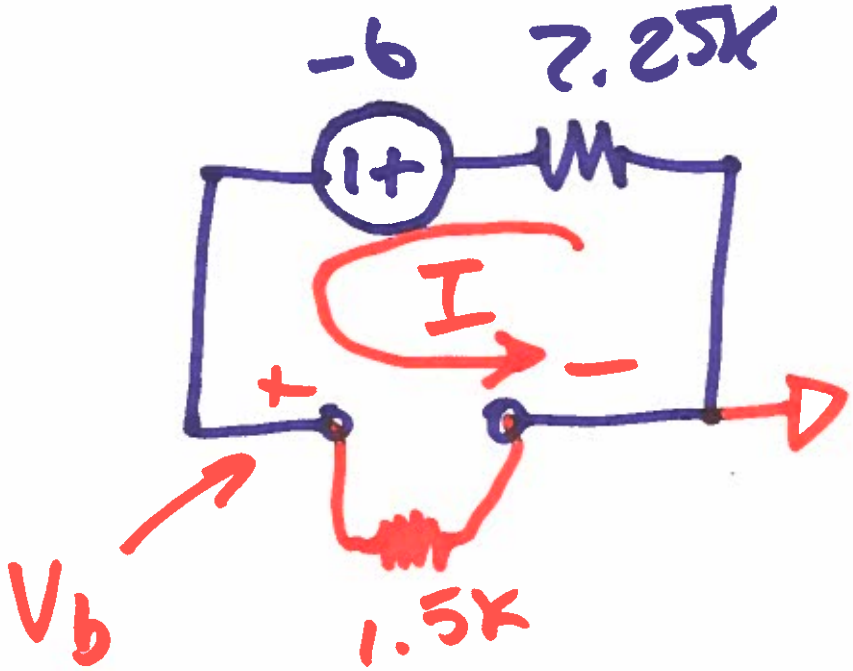
$V_{OC} = -6V = V_{TH}$

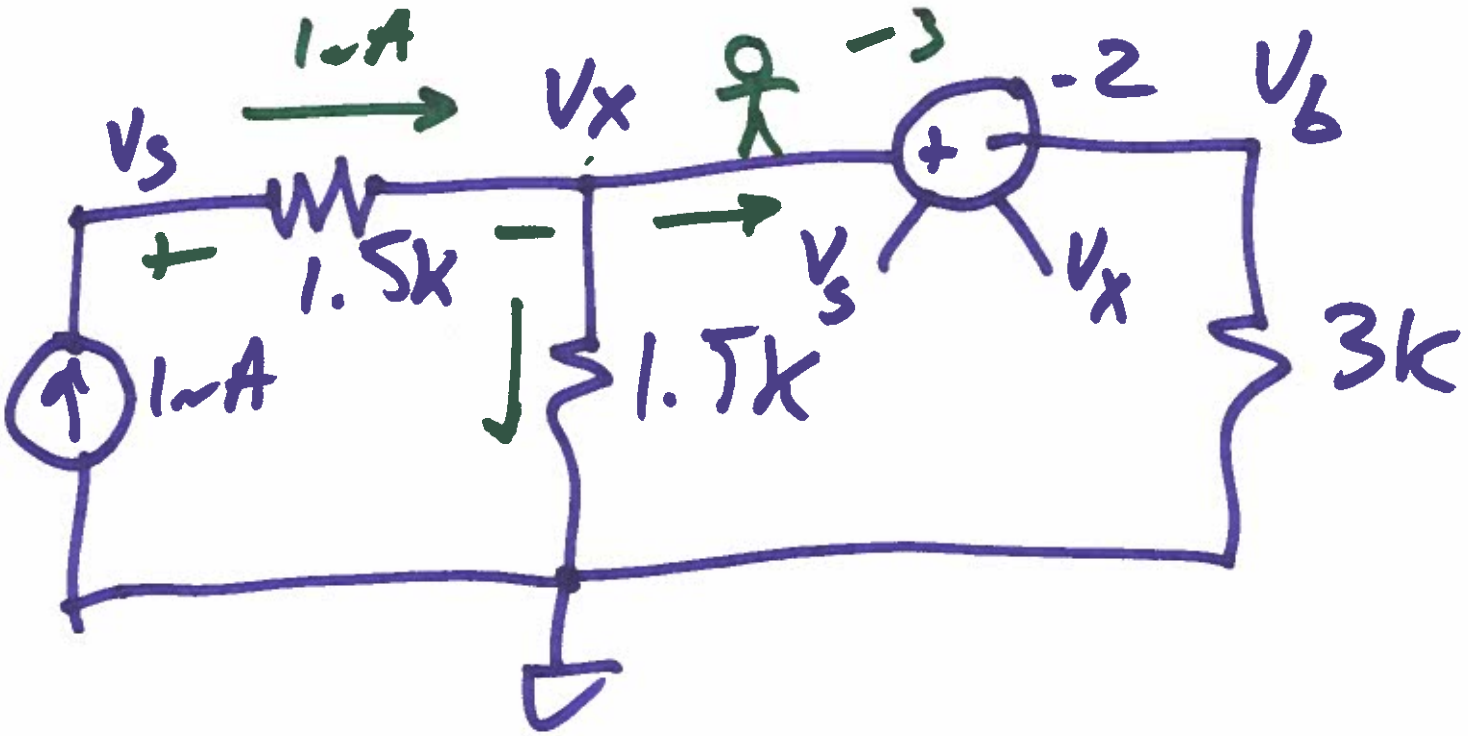


$$V_b = \frac{-6}{2.25k+1.5k} \cdot 1.5k$$

I

$$V_b = -2.4V$$



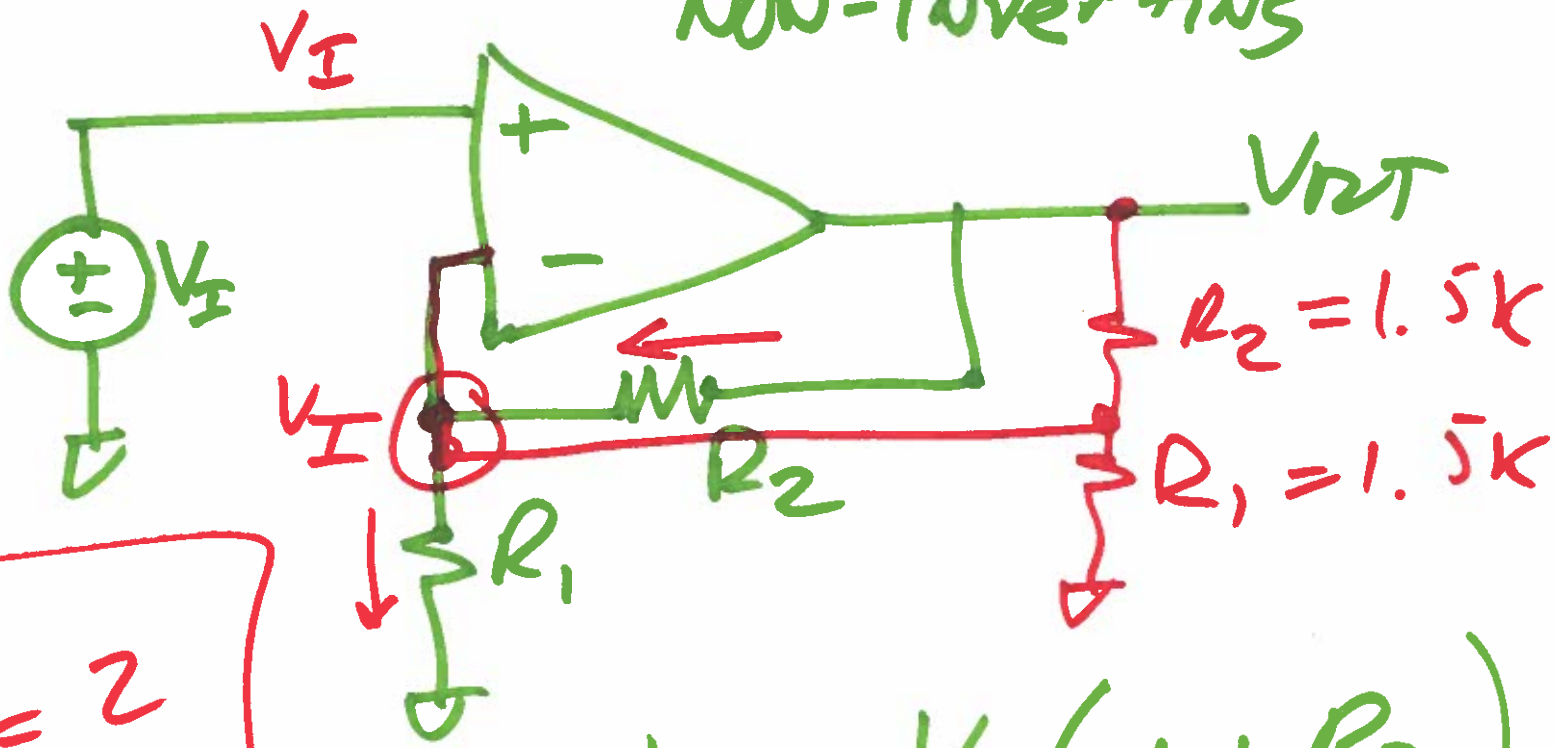


$$V_s - V_x = 1.5V$$

$$V_x - (-2)1.5 = V_b$$

$$\frac{V_b}{3k} + \frac{V_x}{1.5k} = 1mA$$

NON-inverting



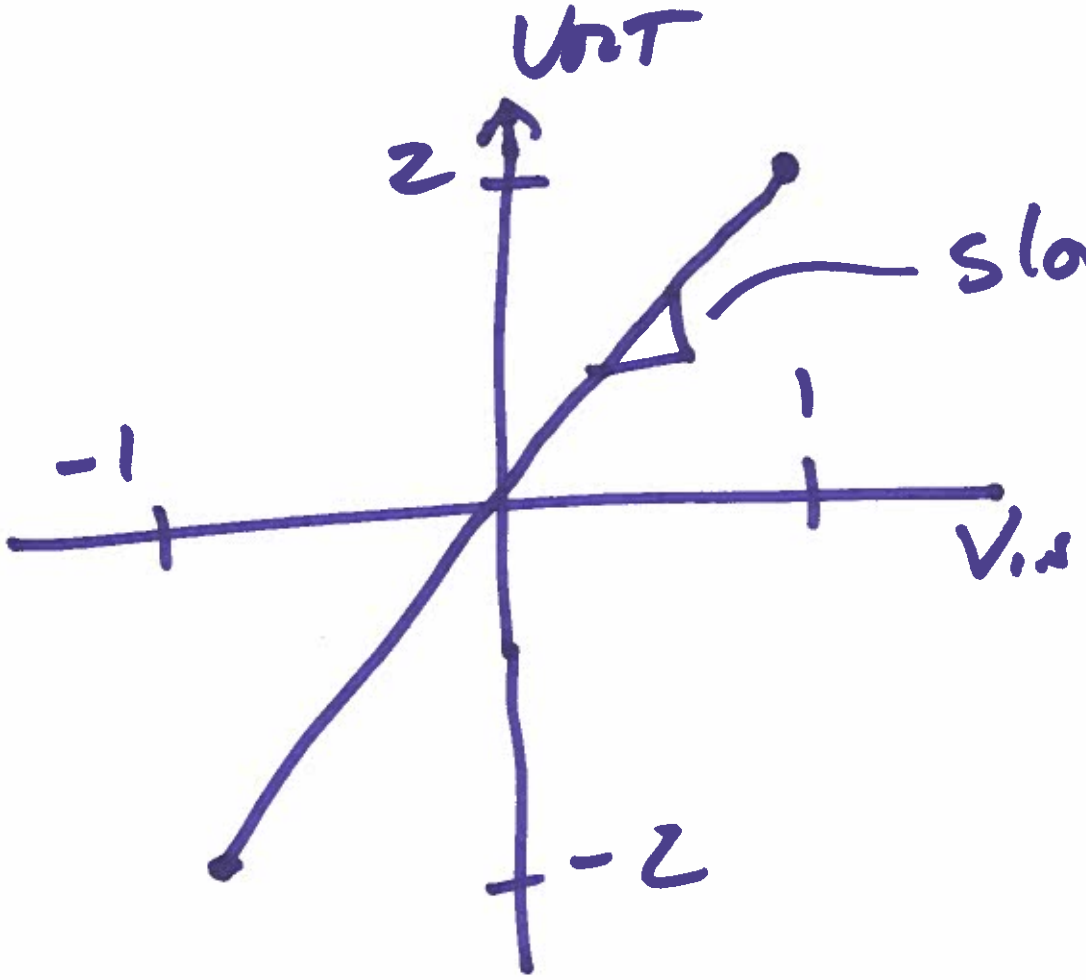
$$\frac{V_{OUT}}{V_{IN}} = 2$$

$$V_{OUT} = V_I\left(1 + \frac{R_2}{R_1}\right)$$

$$\frac{V_I}{R_1} = \frac{V_{OUT} - V_I}{R_2}, \quad V_I \cdot \frac{R_2}{R_1} = V_{OUT} - V_I$$

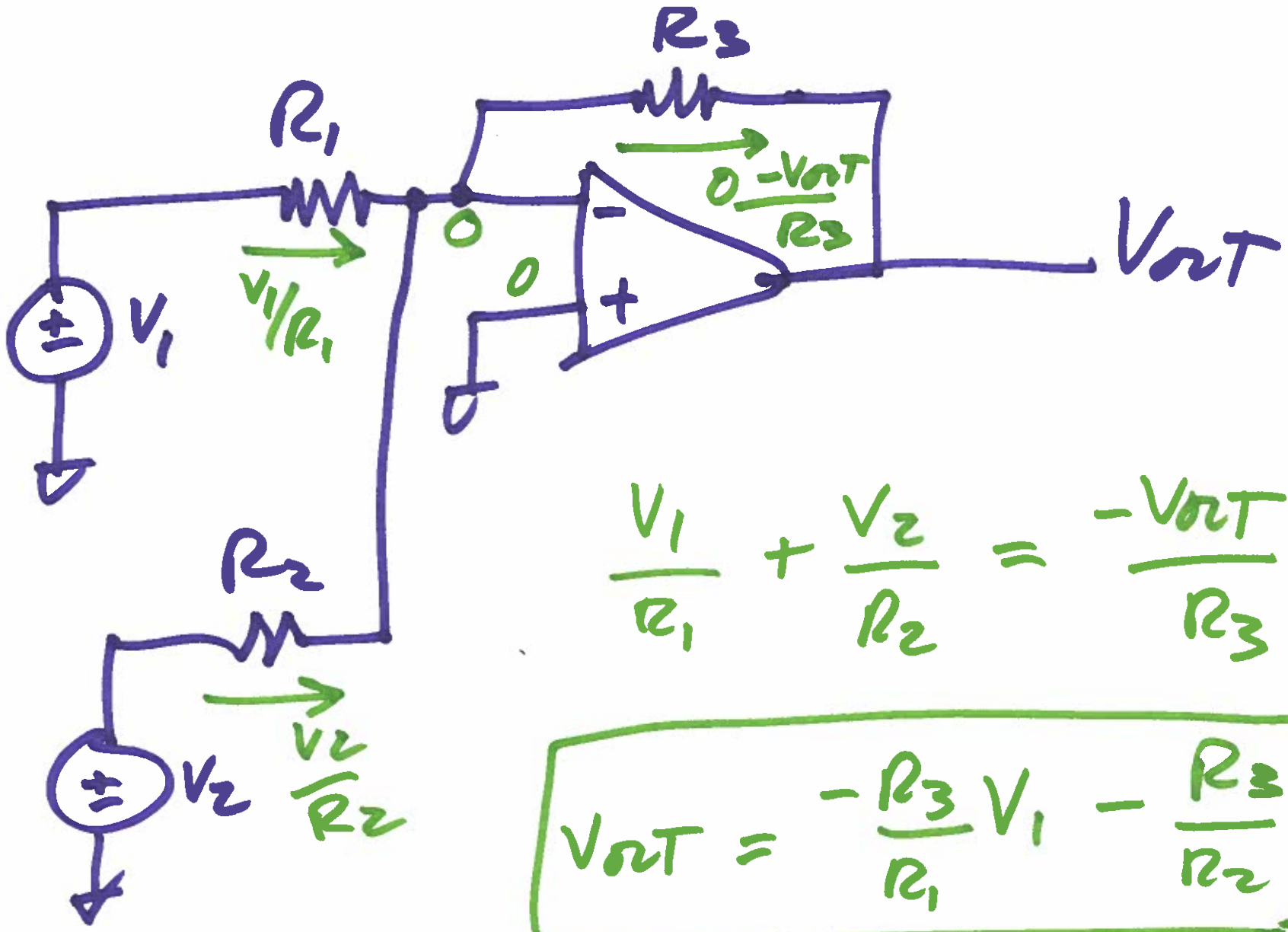
$$V_{OUT} = V_I\left(1 + \frac{R_2}{R_1}\right)$$

$V_{OUT} = 2V_I$



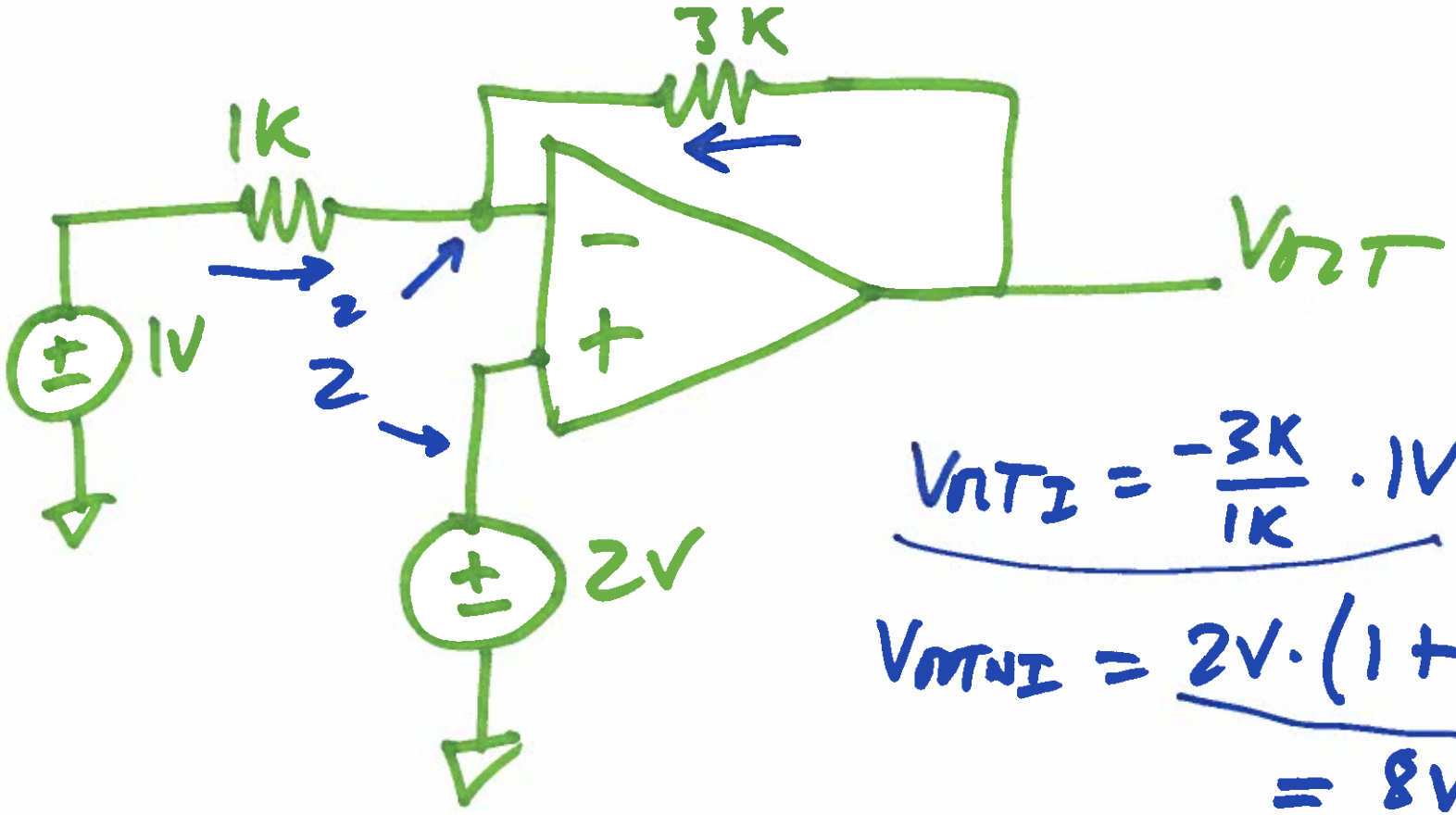
slope is the gain

$$gain = \frac{V_{OUT}}{V_{IN}} = 2$$



$$\frac{V_1}{R_1} + \frac{V_2}{R_2} = \frac{-V_{oT}}{R_3}$$

$$V_{oT} = -\frac{R_3}{R_1} V_1 - \frac{R_3}{R_2} V_2$$



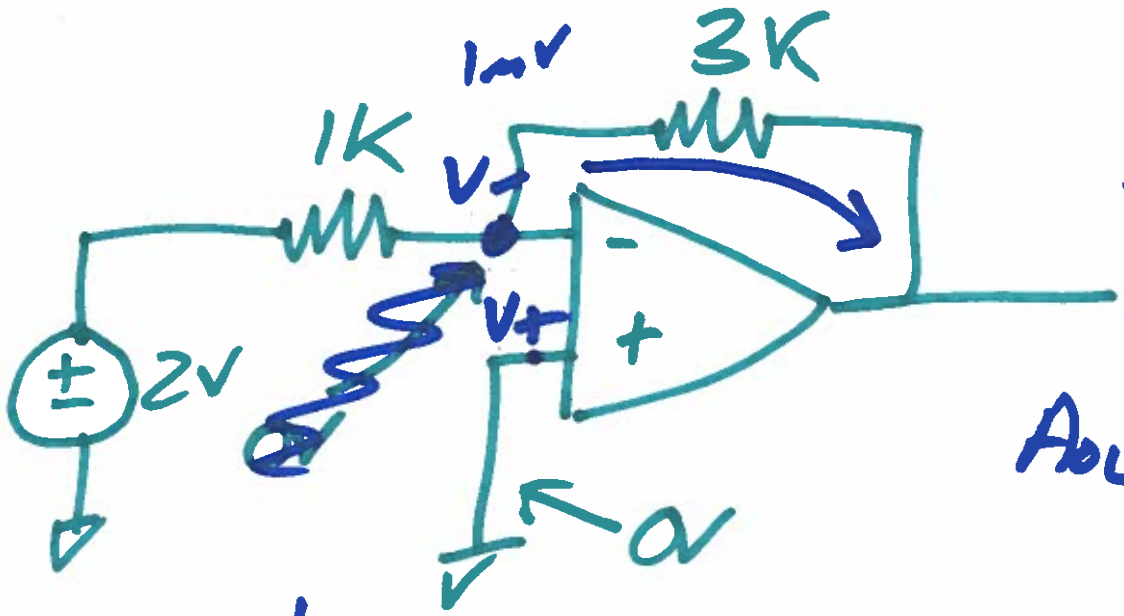
$$V_{OUT1} = \frac{-3K}{1K} \cdot 1V = -3$$

$$V_{OUT2} = 2V \cdot \left(1 + \frac{3K}{1K}\right) = 8V$$

$$\frac{1-2}{1K} + \frac{V_{OUT}-2}{3K} = 0 \qquad V_{OUT} = 8 - 3 = 5V$$

$$2 - V_{OUT} = -3V$$

$$\boxed{V_{OUT} = 5V}$$



$-1{,}000V$

$V_{OUT} =$

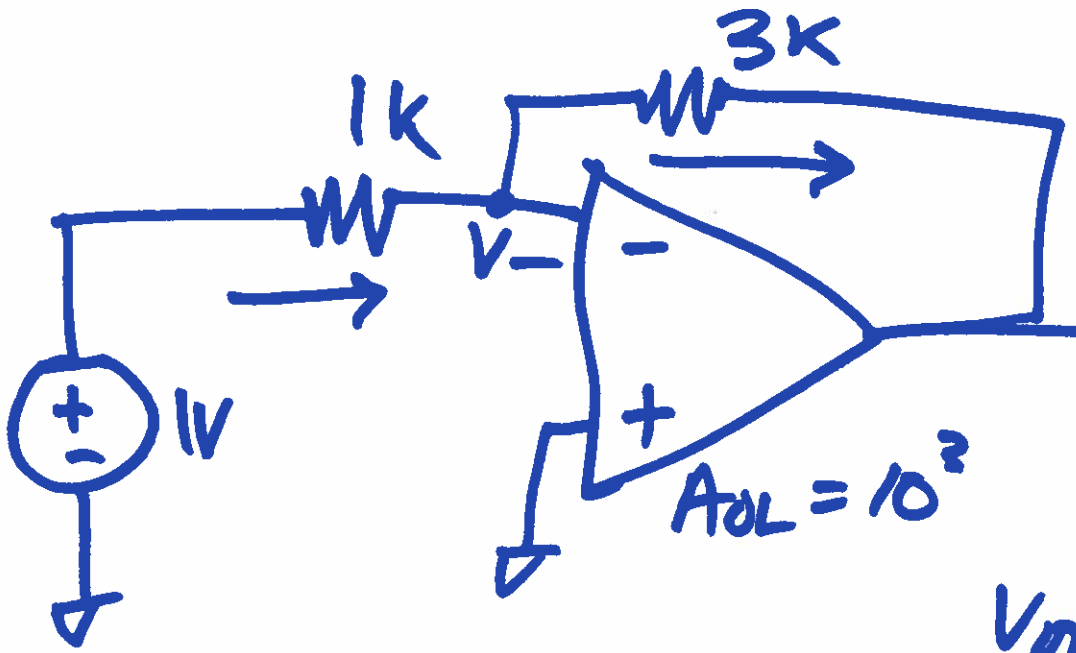
$A_{OL} =$ Gain of OP-AMP

$1_4V = 10^{-6}V$

$$V_{OUT} = A_{OL}(V_+ - V_-)$$

$$-1{,}000V = -10^3 = A_{OL}(0 - 1mV)$$

$A_{OL} = 10^6$ $\quad -10^{-3}$



$V_{OUT} = -V_- \cdot 10^3$

$V_- = \frac{-V_{OUT}}{10^3}$

$V_{OUT} = \frac{-3}{1.004}$

$\frac{1 - V_-}{1K} = \frac{V_- - V_{OUT}}{3K}$

$3 = V_{OUT}\left(\frac{3}{10^3} + \frac{1}{10^3} + 1\right)$

$1 + .001 + .003$

$1 + \frac{V_{OUT}}{10^3} = \frac{1}{3}\left(\frac{-V_{OUT}}{10^3} - V_{OUT}\right)$

$3 + \frac{V_{OUT} \cdot 3}{103} = \frac{-V_{OUT}}{10^3} - V_{OUT}$

10)