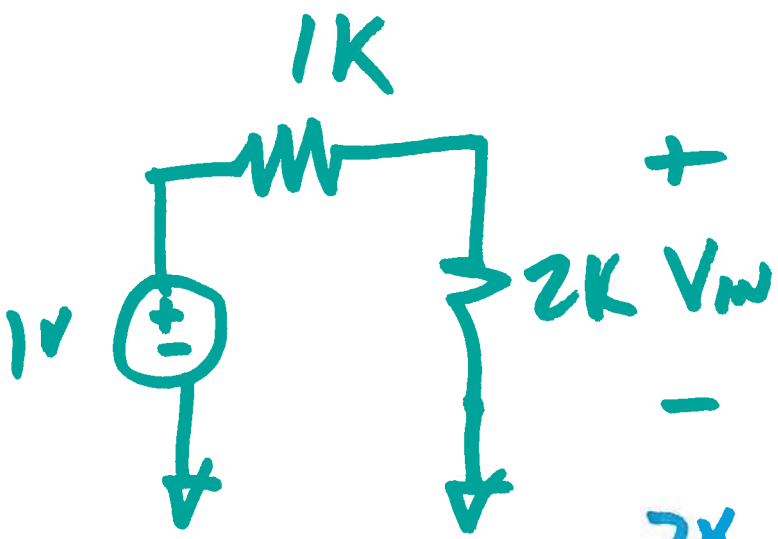
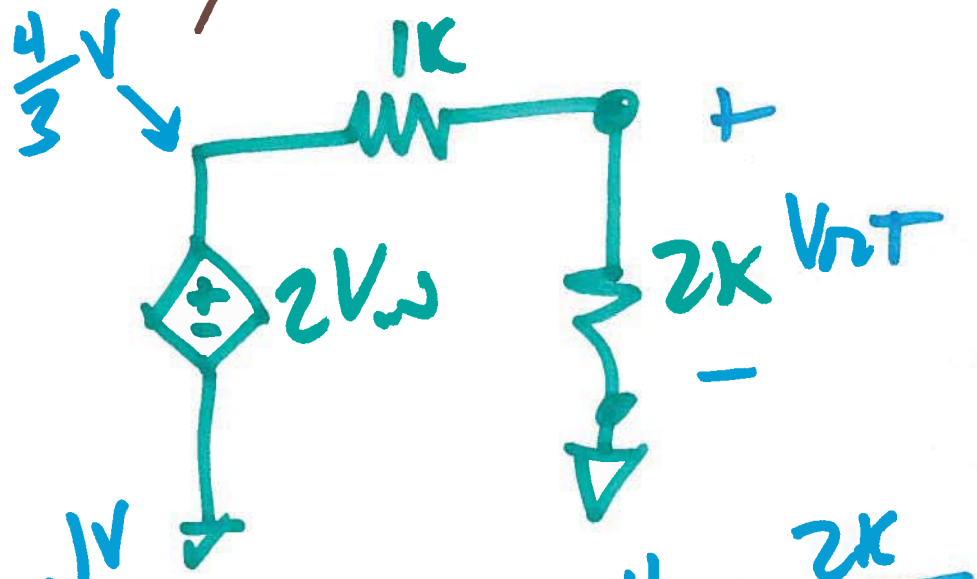
EE 220
Circuits I

OCT. 5, 2016

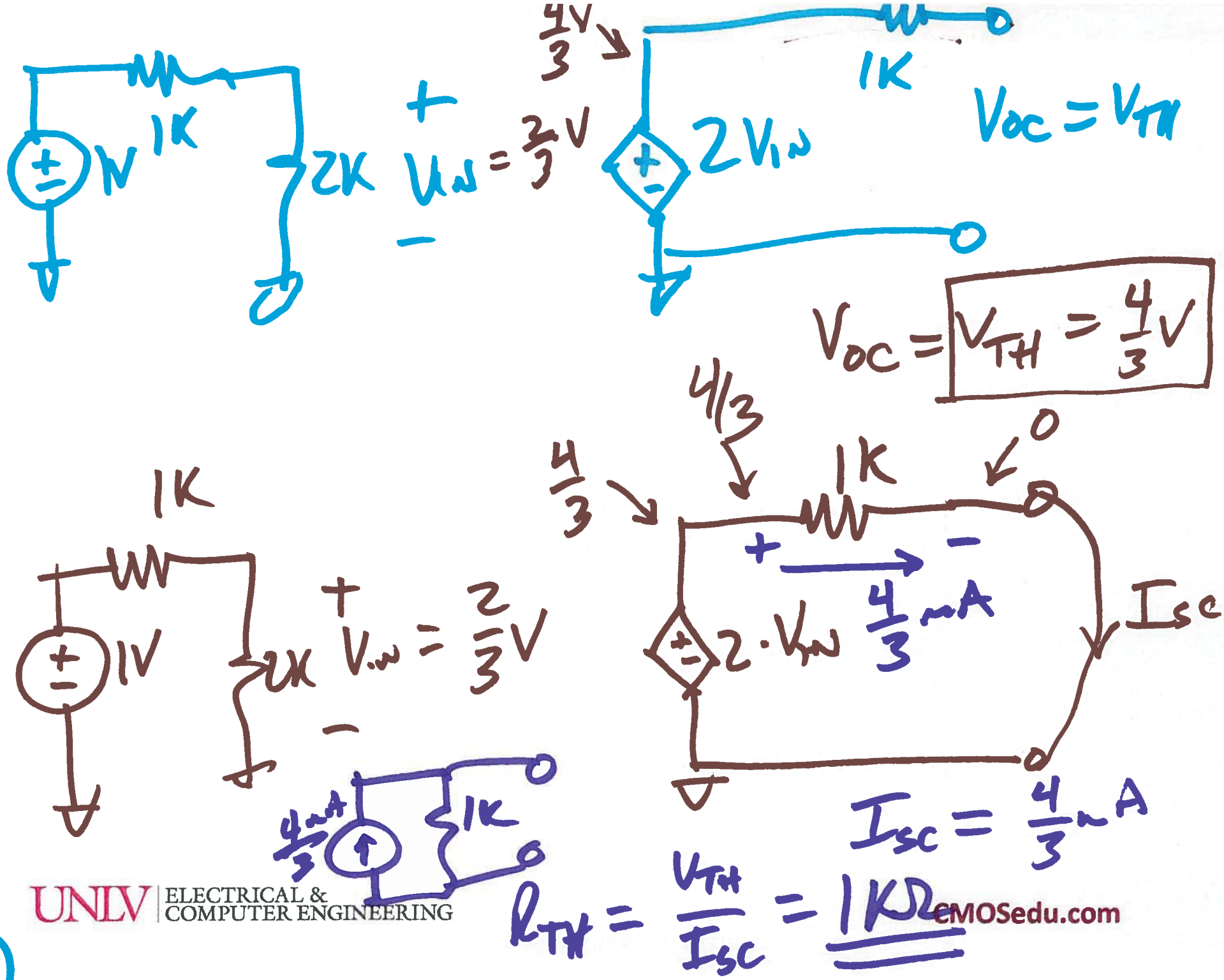


$$V_{in} = \frac{2K}{1K+2K} \cdot 1V = \frac{2}{3}V$$



$$V_{out} = \frac{4}{3} \cdot \frac{2K}{1K+2K}$$

$$V_{out} = \frac{8}{9}V$$


1K
1V
2K
+
$V_{1\Omega} = \frac{2}{3}V$
−
$\frac{4}{3}V$
1K
$2V_{1\Omega}$
$V_{OC} = V_{TH}$
$V_{OC} = V_{TH} = \frac{4}{3}V$
1K
1V
2K
+
$V_{1\Omega} = \frac{2}{3}V$
−
$\frac{4}{3}$mA
1K
$\frac{4}{3}$
1K
0
+
−
$\frac{4}{3}$mA
$2 \cdot V_{1\Omega}$
$\frac{4}{3}$
I_{SC}
$I_{SC} = \frac{4}{3}$mA
$R_{TH} = \frac{V_{TH}}{I_{SC}} = 1K\Omega$
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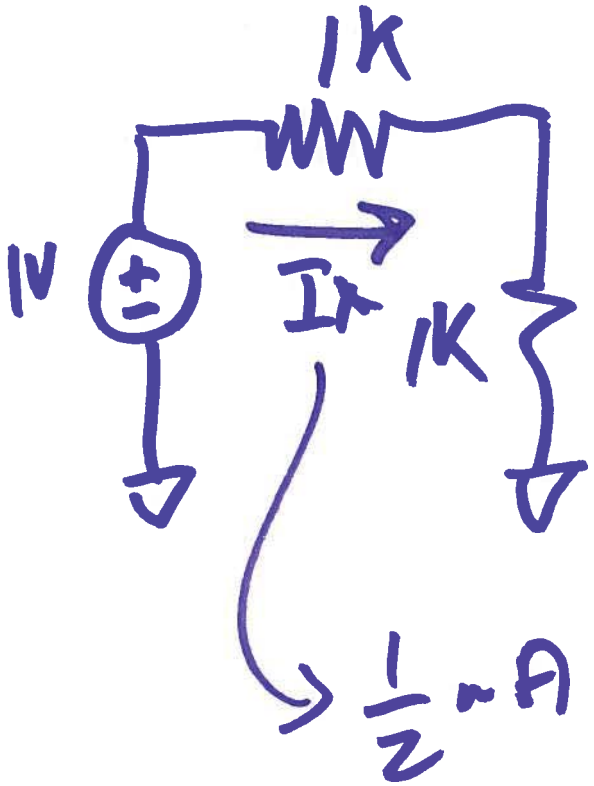
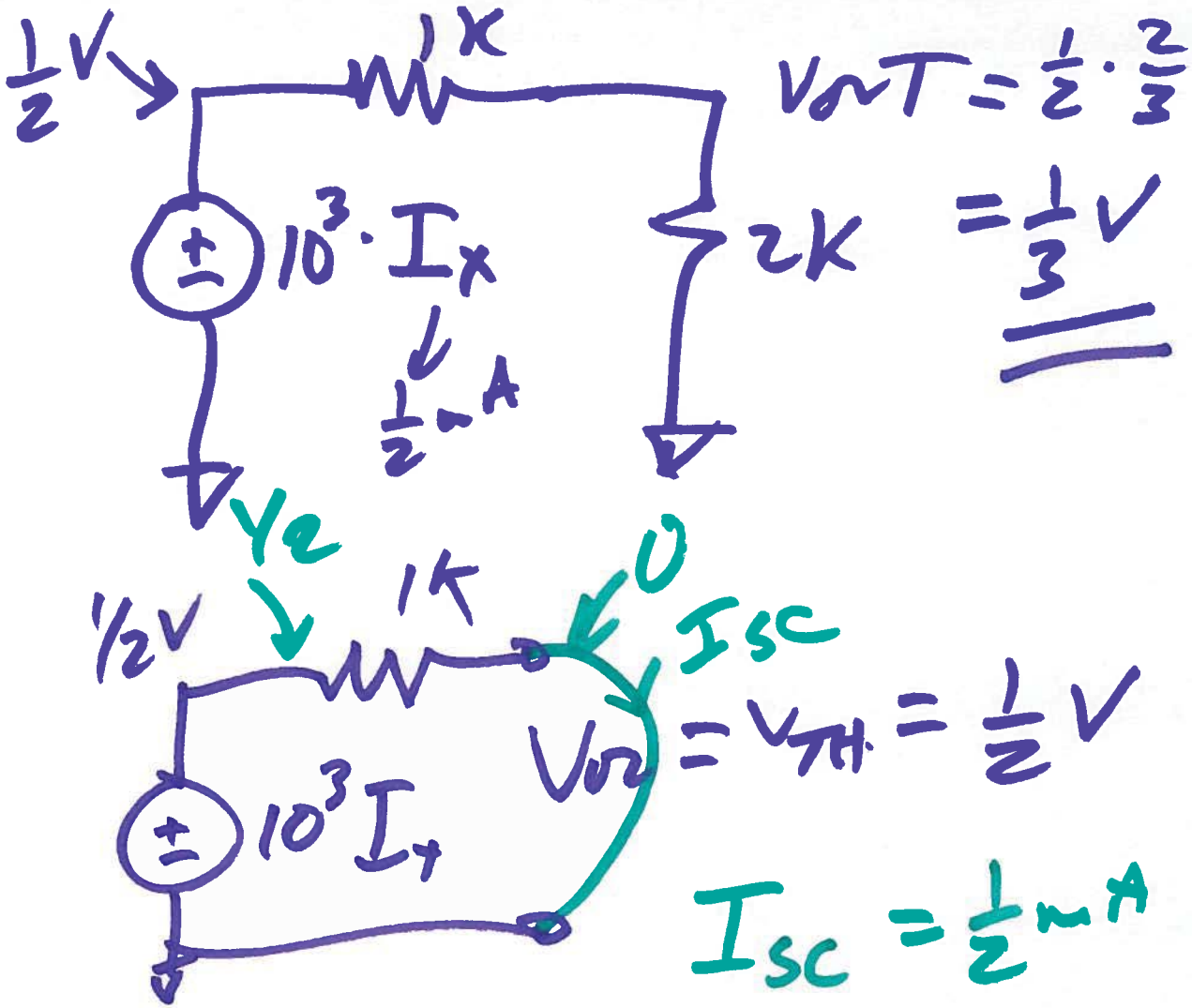
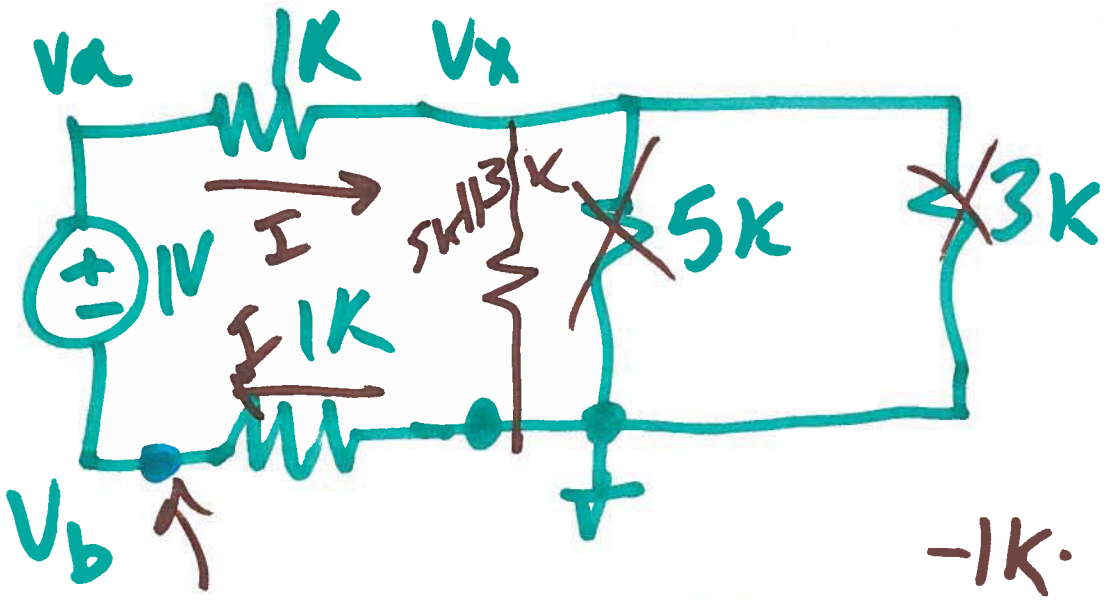
2)


1K
1V
Ix
1K
½ mA


½V
1K
$V_{OUT} = \frac{1}{2} \cdot \frac{2}{3}$
$= \frac{1}{3}V$
$10^3 \cdot I_x$
2K
½ mA
Ye
1K
0
½V
Isc
$V_{TH} = \frac{1}{2}V$
V_{TH}
$10^3 I_1$
$I_{SC} = \frac{1}{2}$ mA
$R_{TH} = 1k$

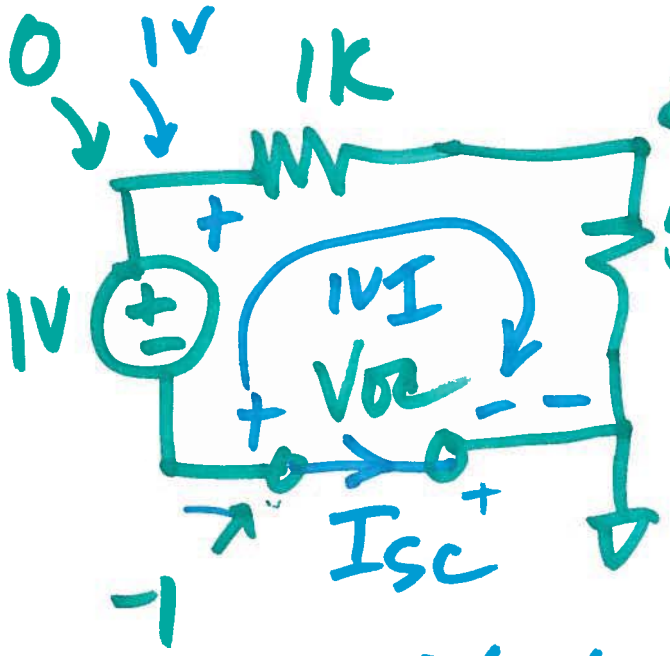


$$I = \frac{1V}{1k + 5k||3k + 1k}$$

$$V_b = -I \cdot 1k = \frac{-1k \cdot 1V}{2k + \frac{15}{8}k} = -\frac{1}{\frac{31}{8}}$$

$$= -\frac{8}{31}V$$

$$\boxed{V_b = -\frac{8}{31}V}$$

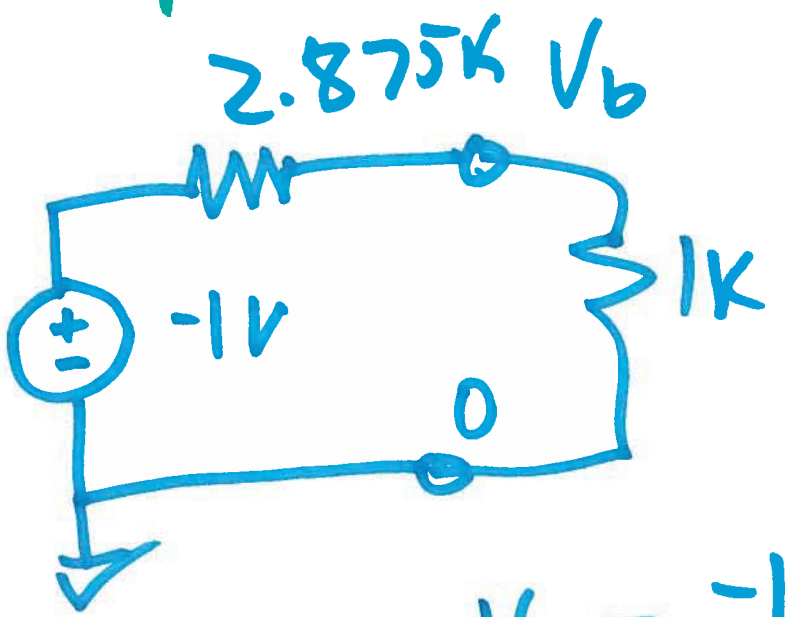


$5k \| 3K = \frac{15}{8} K = 1\frac{7}{8} K = 1.875K$

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

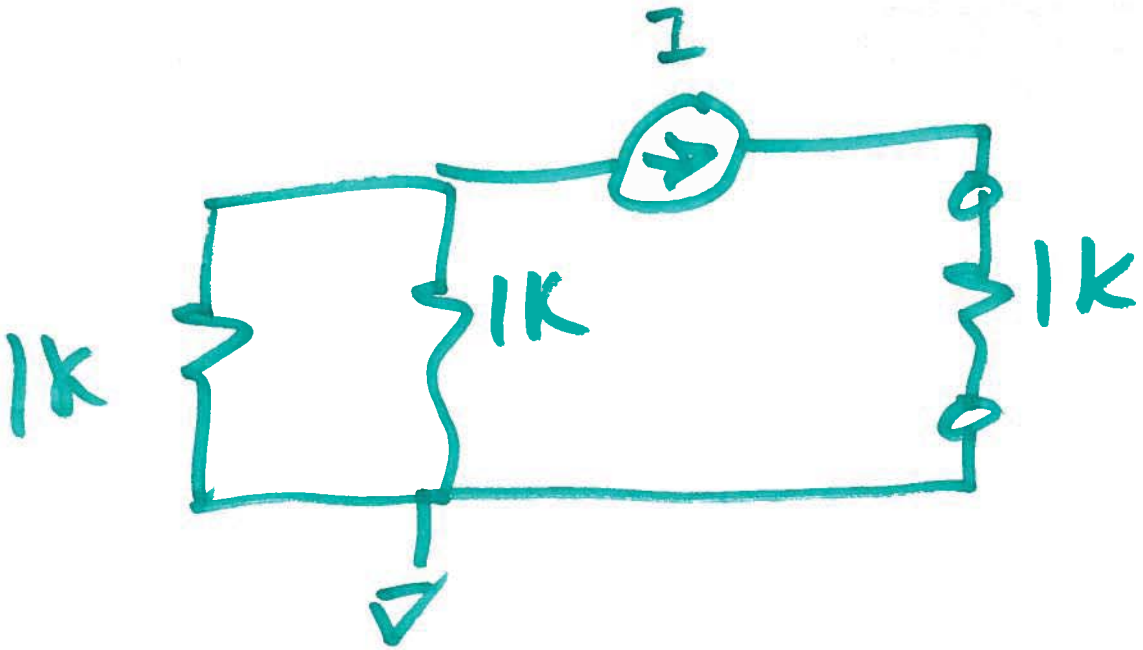
$$I_{SC} = \frac{-1V}{1K + 1.875K}$$

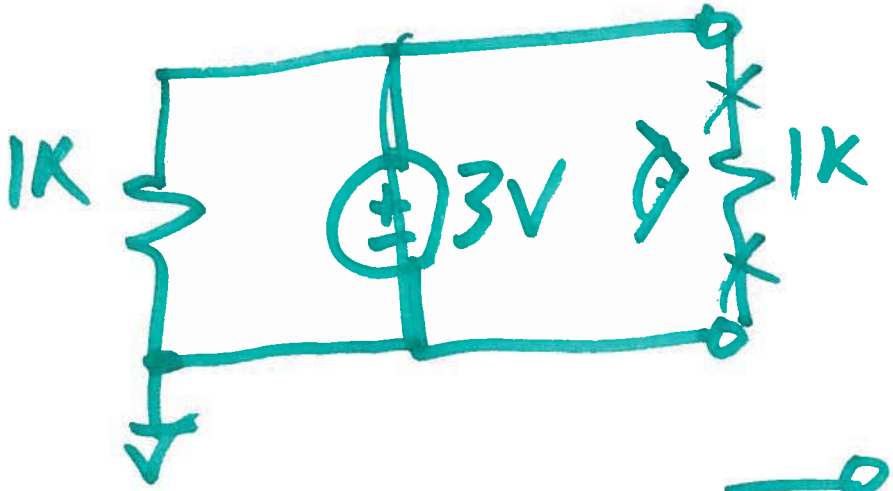
$$R_{THN} = \frac{V_{OC}}{I_{SC}} = 2.875K$$



$$V_b = -1 \cdot \frac{1K}{1K + 2.875K} = \frac{-1K}{1K + \frac{23}{8}K}$$

$$= -\frac{8}{31} V$$





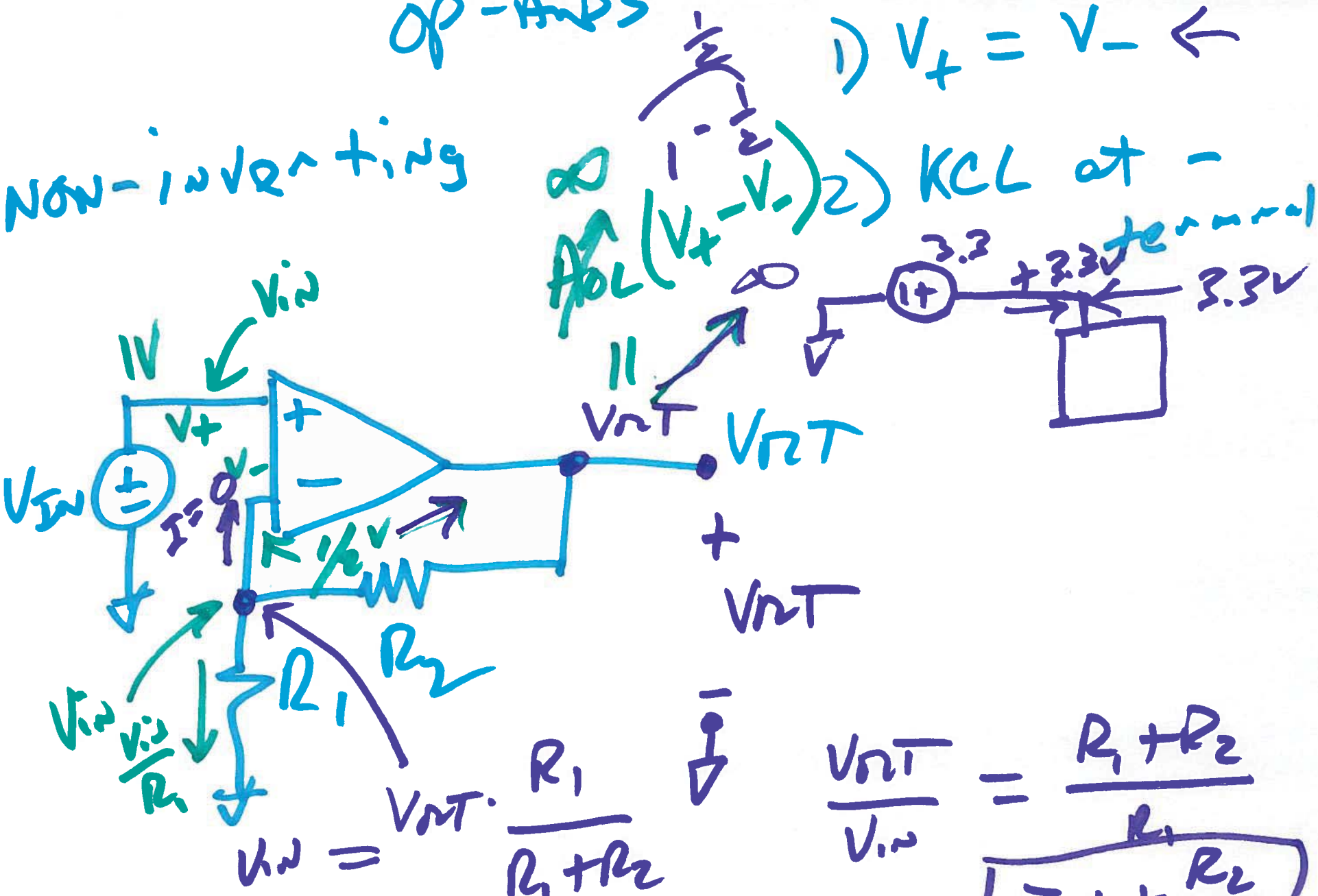
$V_{OC} = 3V$

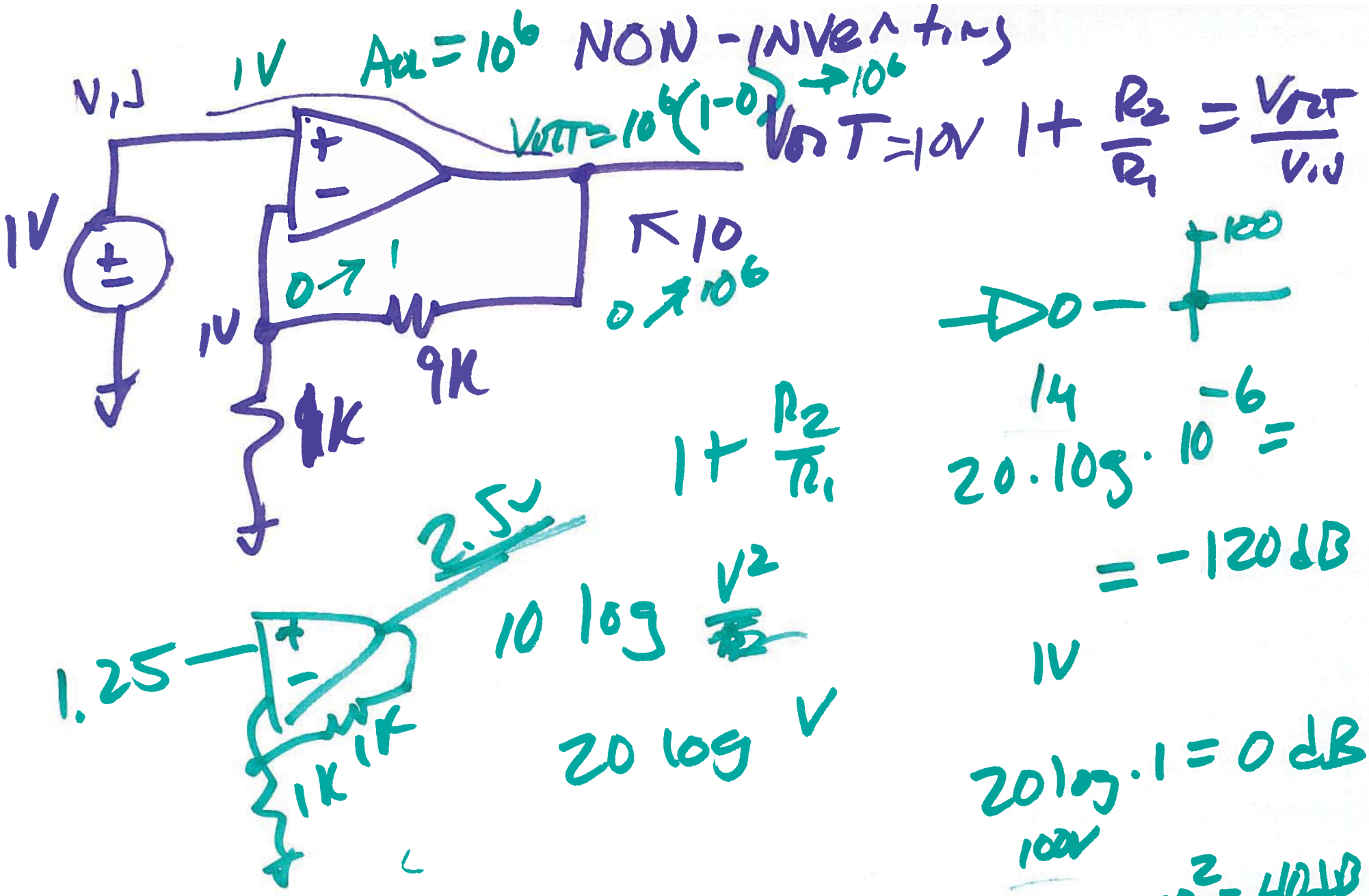
$R_{THV} = 0$

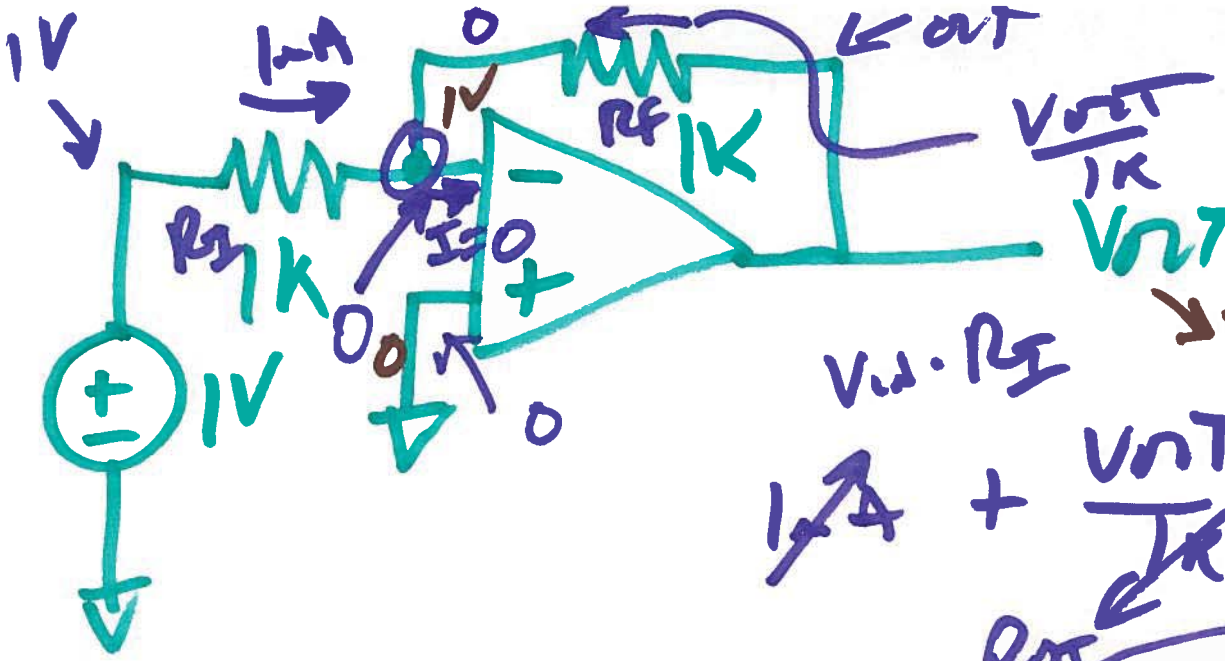
(a)

op-AMPS

NON-INVERTING




NON-INVERTING
$A_{OL}=10^6$
1V
V_{IN}
$V_{OUT}=10^6(1-0)\rightarrow 10^6$
$V_{OUT}=1V\left(1+\frac{R_2}{R_1}\right)=\frac{V_{OUT}}{V_{IN}}$
1V
0 → 1
1V
9K
1K
10
0 → 10^6
100
0
-6
$20\cdot\log\cdot 10^{-6}=$
$=-120dB$
1V
$20\log\cdot 1=0dB$
100V
$20\log\cdot 10^2=40dB$
2.5V
1.25
1K
1K
$1+\frac{R_2}{R_1}$
$10\log\frac{V^2}{R}$
$20\log V$



inverting

$= A_{OL}(0-1)$ op-Amp

$V_{in} \cdot R_F$

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

R_T

$$V_{OUT} = -\frac{R_F}{R_T} = -1V$$

A_{OL} = open-loop gain

↓

gain of op-amp