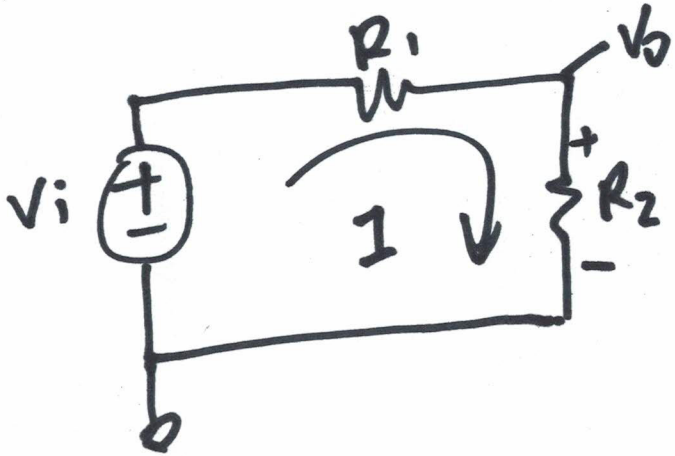


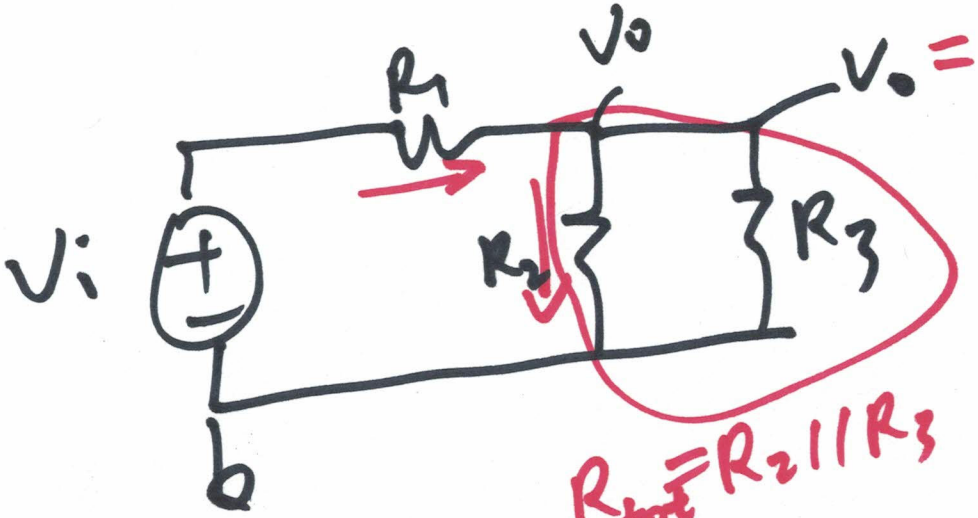
$$V_o = \frac{R_2}{R_1+R_2} V_i$$

$$V_o = I \cdot R_2$$

$$V_i = I \cdot (R_1+R_2)$$

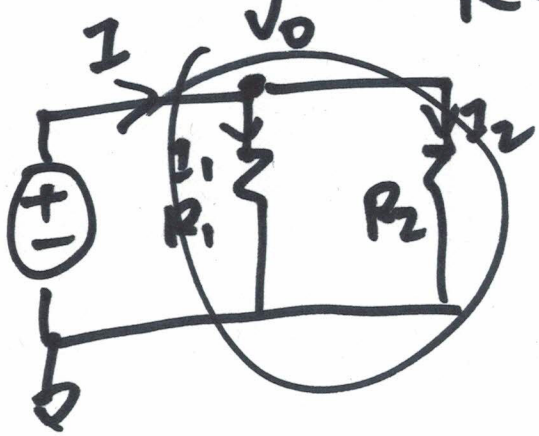
$$\frac{V_o}{V_i} = \frac{I \cdot R_2}{I \cdot (R_1+R_2)}$$

$$V_o = V_i \cdot \frac{R_2}{R_1+R_2}$$



$$V_o = V_i \cdot \frac{R_{tot}}{R_1+R_{tot}}$$

$$R_{tot} = R_2 \,||\, R_3$$



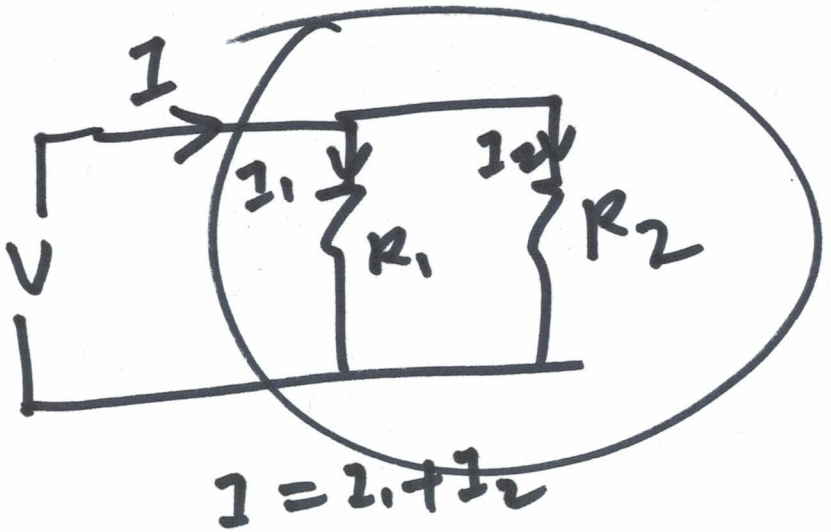
$$R = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$$\begin{cases} I_1 = I \cdot \dfrac{R_2}{R_1 + R_2} \\ I_2 = I \cdot \dfrac{R_1}{R_1 + R_2} \end{cases}$$

$$I \cdot R = I_1 \cdot R_1$$

$$I \cdot \frac{R_1 \cdot R_2}{R_1 + R_2} = I_1 \cdot R_1$$

$$I \cdot \frac{R_1 \cdot R_2}{R_1 + R_2} = I_2 \cdot R_2$$



$$I = I_1 + I_2$$

$$\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2}$$

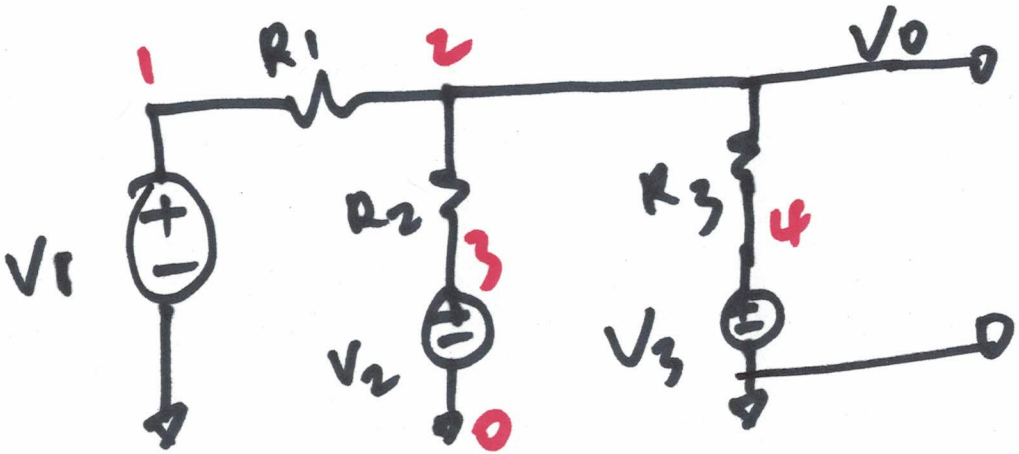
$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

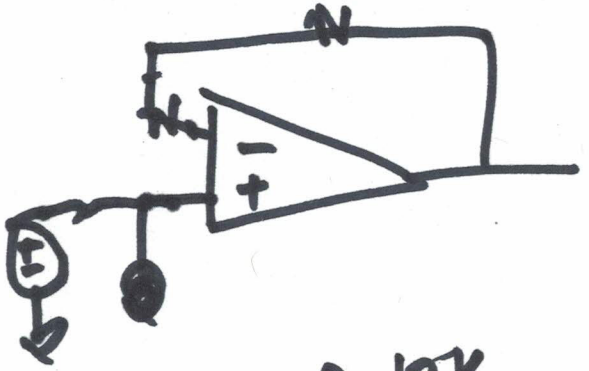
$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

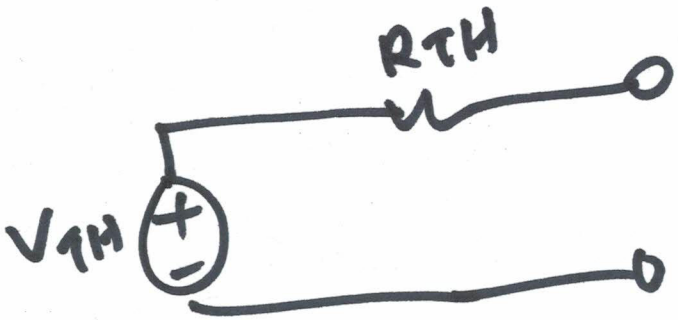
$$= \frac{R_1 \cdot R_2}{R_1 + R_2}$$

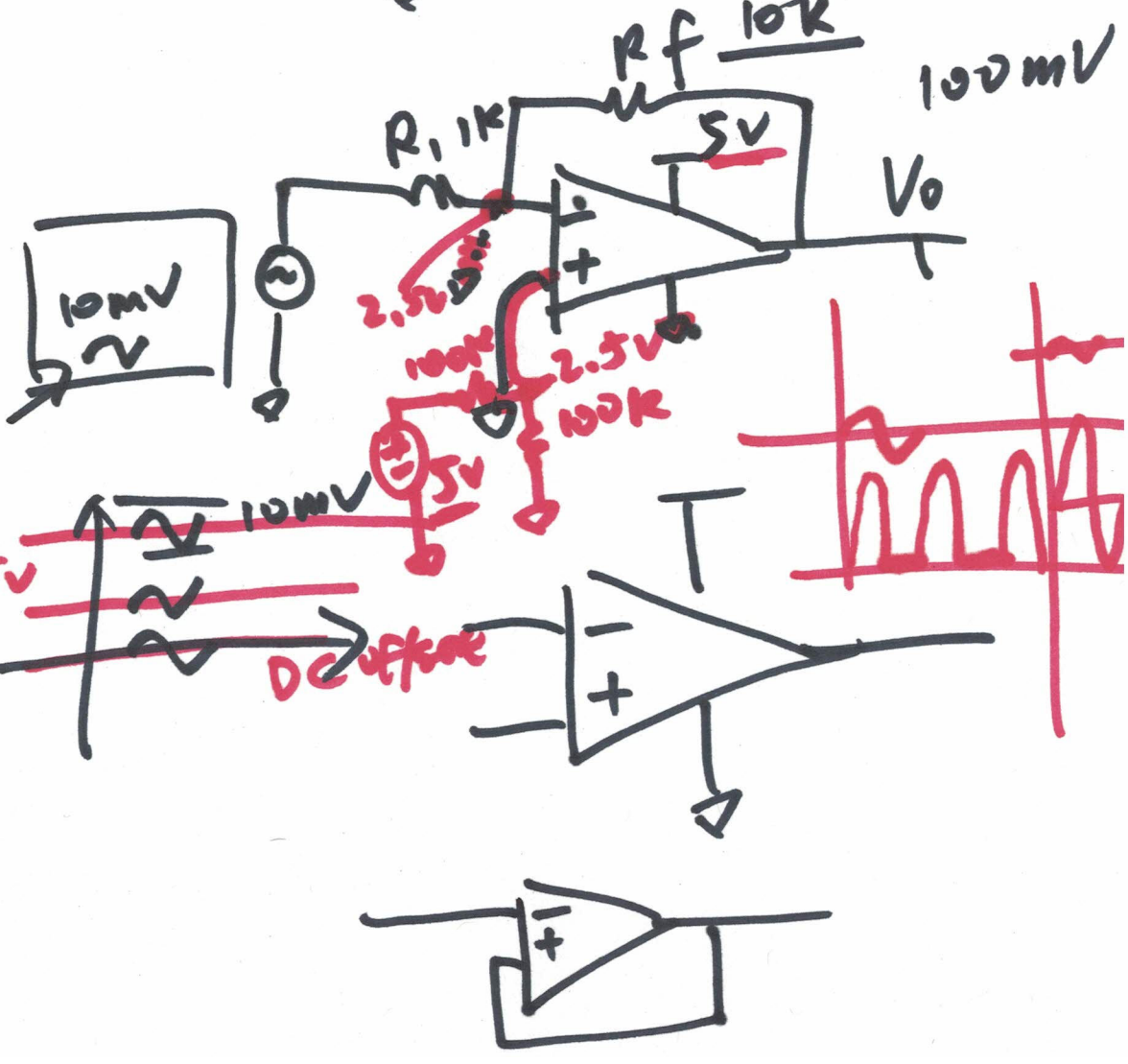
$$R = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

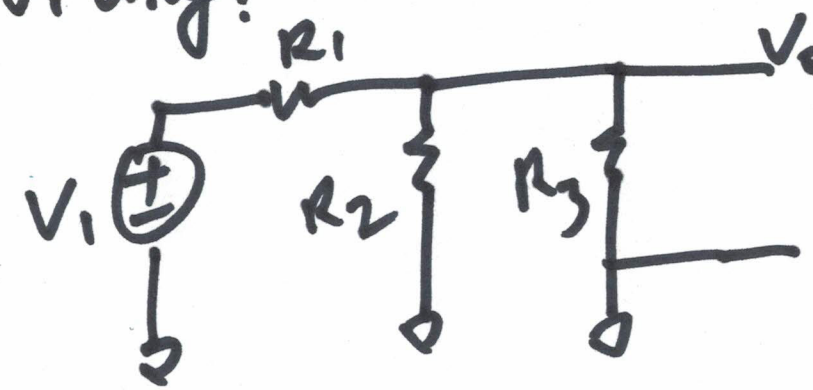

1
R1
2
Vo
R2
3
R3
4
V1
V2
V3
0




RTH
VTH

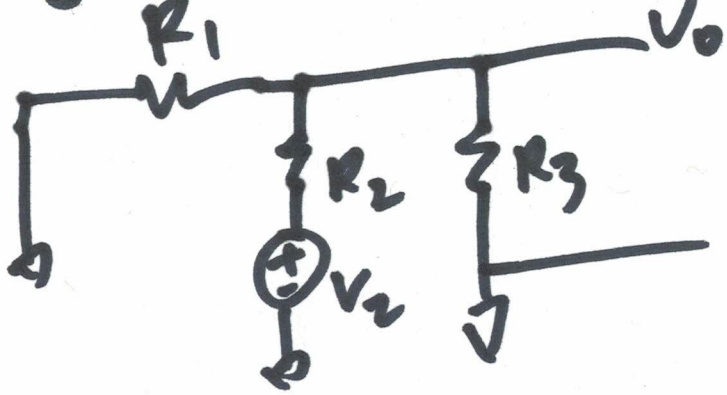

Rf 10K
100mV
R1 1K
5V
Vo
10mV
2.5V
100K
2.5V
100K
5V
10mV
2.5V
DC offset

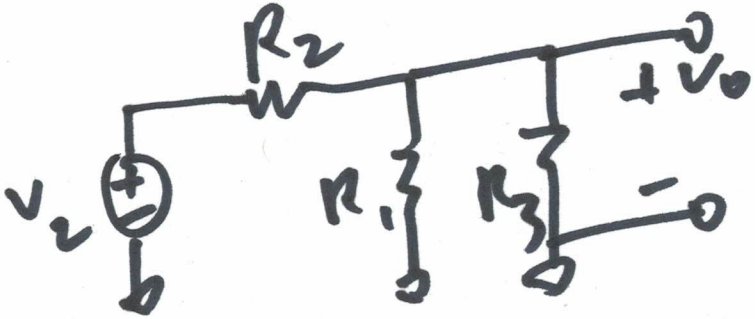
① V_1 only:



$$V_o = V_1 \cdot \frac{R_2 \| R_3}{R_1 + R_2 \| R_3}$$

② V_2 only

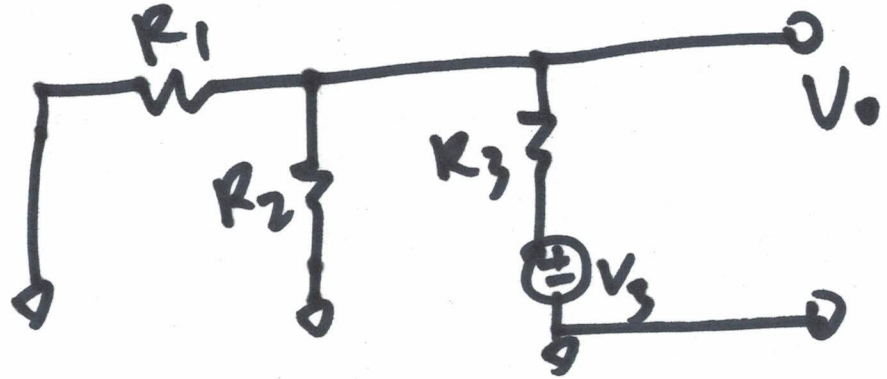


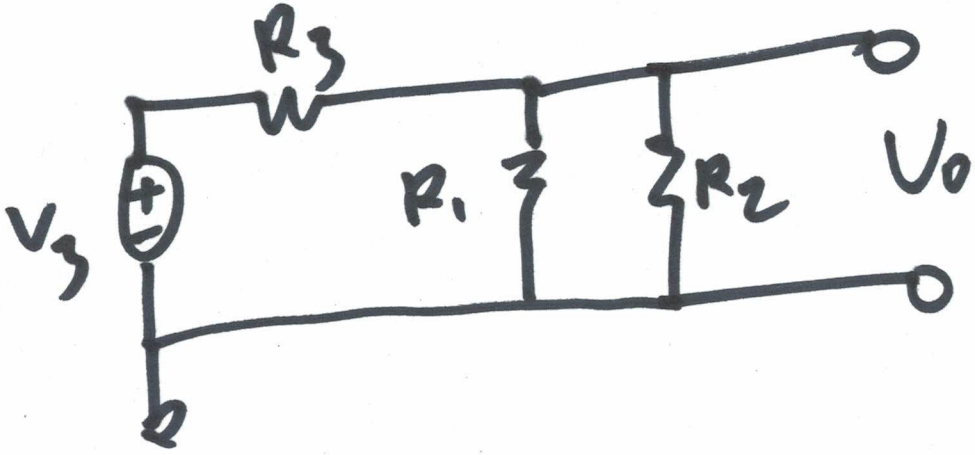


$$V_o = V_2 \cdot \frac{R_1 \| R_3}{R_2 + R_1 \| R_3}$$

③

③ V_3 only





$$V_o = V_3 \cdot \frac{R_1 \| R_2}{R_3 + R_1 \| R_2}$$

$$V_o = V_1 \cdot \frac{R_2 \| R_3}{R_1 + R_2 \| R_3} + V_2 \cdot \frac{R_1 \| R_3}{R_2 + R_1 \| R_3} + V_3 \cdot \frac{R_1 \| R_2}{R_3 + R_1 \| R_2}$$

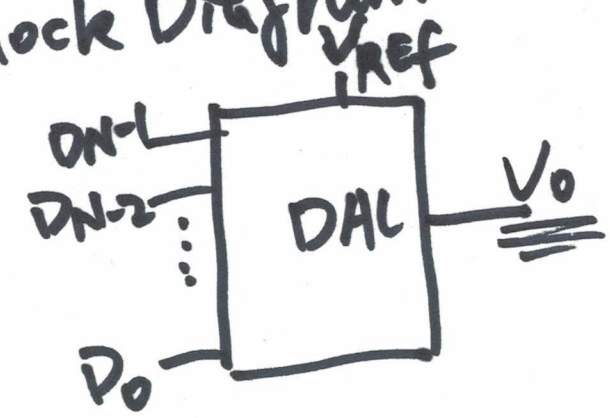
$R_1 = 2K \quad R_2 = 4K \quad R_3 = 6K \quad V_1 = 2V \quad V_2 = 4V \quad V_3 = 6V$

(b)

$V_o = 3.27V.$

Digital to Analog Converter (DAC)

① Block Diagram



N-bit DAC

$$V_{FS} = \frac{2^N - 1}{2^N} \cdot V_{REF}$$

3-bit: 111 → 7, $2^3 - 1$

② N-bit DAC $\longrightarrow 2^N$ input combinations

$$F = \frac{D}{2^N} \qquad V_o = V_{REF} \cdot \frac{D}{2^N}$$

(D is the input word)

③ 3-bit DAC, input is $100_{(2)}$, $V_{REF} = 5V$

$$F = \frac{100_{(2)}}{2^3} \cdot 5v = \frac{4}{8} \cdot 5v = 2.5v.$$

①