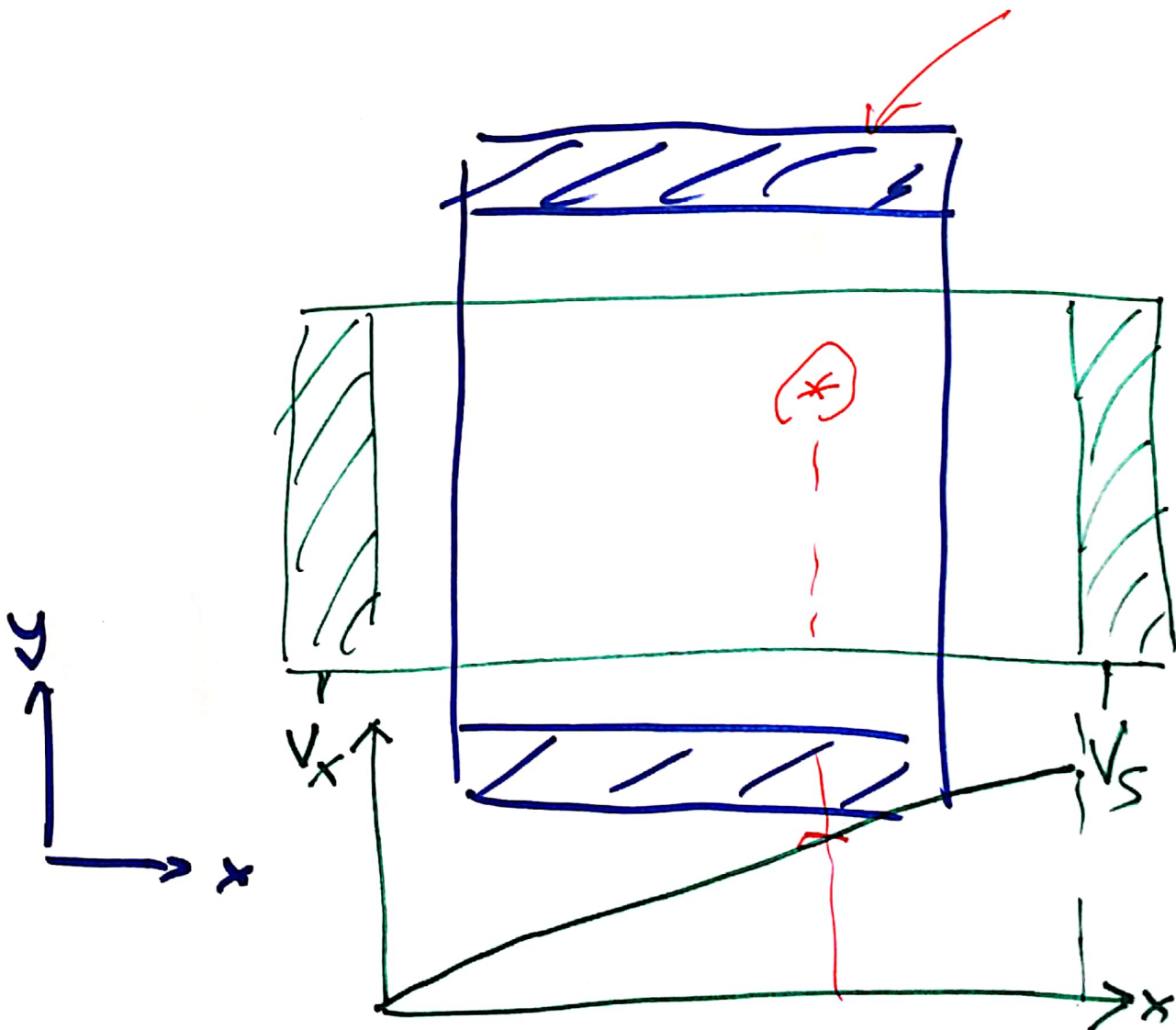
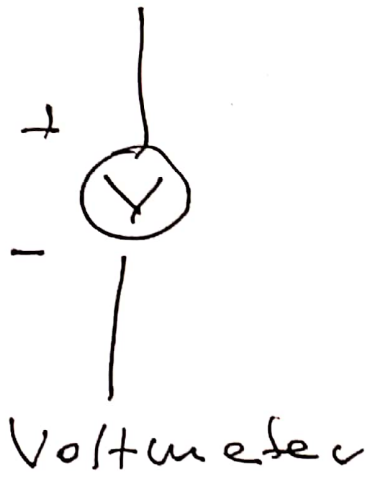
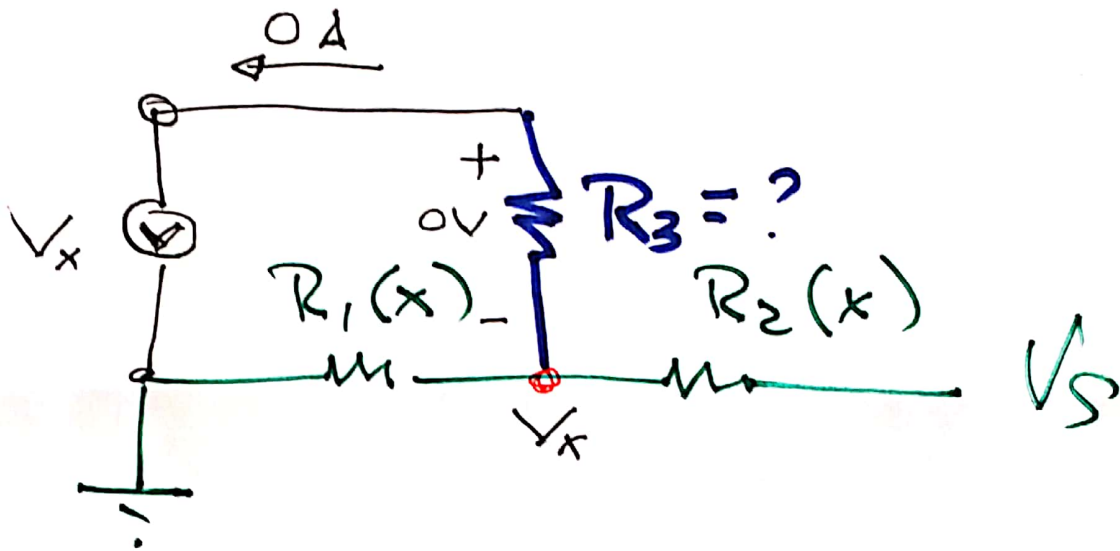


# EECS 16A, Module 2, Lect 4

- 2D resistive touch screen wrapup
- Equivalence
- Superposition
- Controlled Sources



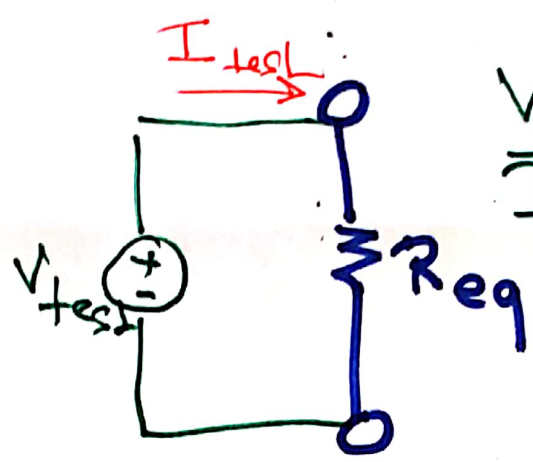
2



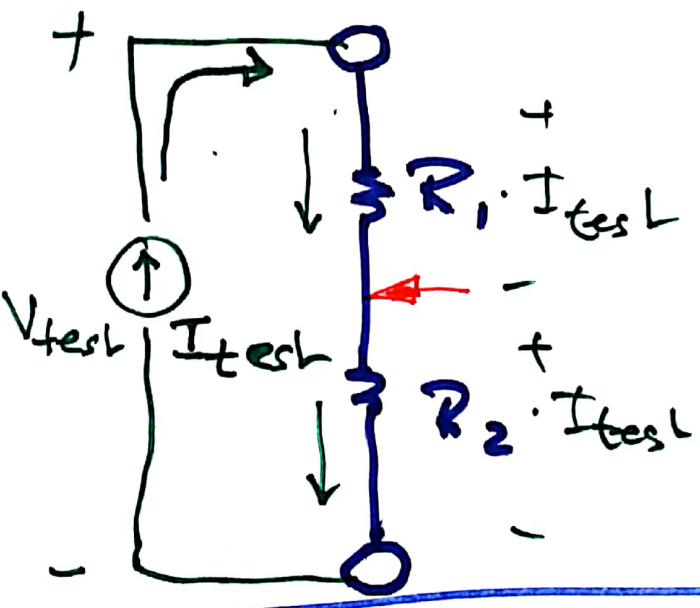
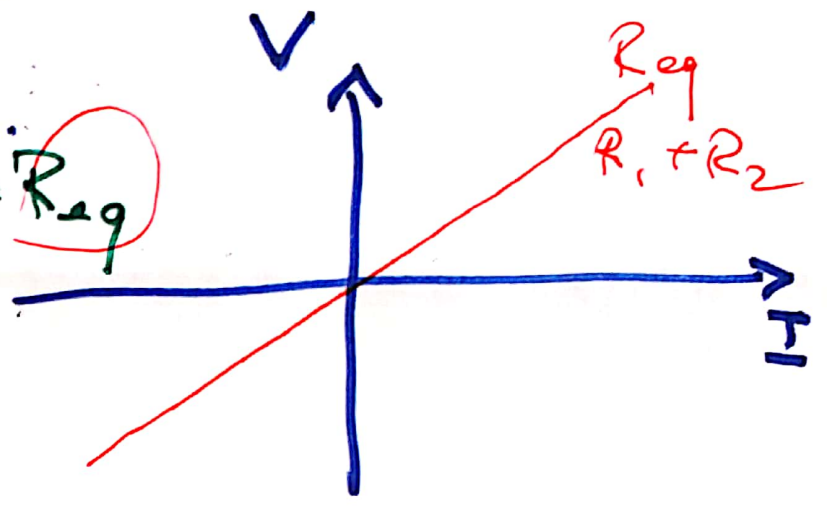
Open Circuit

3

# Equivalence



$$\frac{V_{test}}{I_{test}} = R_{eq}$$



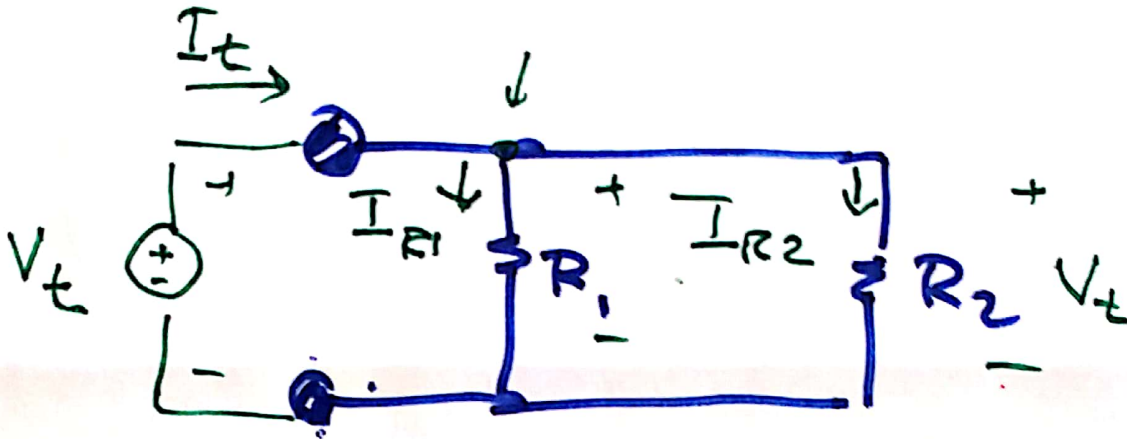
$$V_{test} = (R_1 + R_2) I_{test}$$

$$\frac{V_{test}}{I_{test}} = R_1 + R_2 = R_{eq}$$

Equivalence : same I/V characteristic

$$\text{KCL: } I_{R1} + I_{R2} = I_t$$

(4)

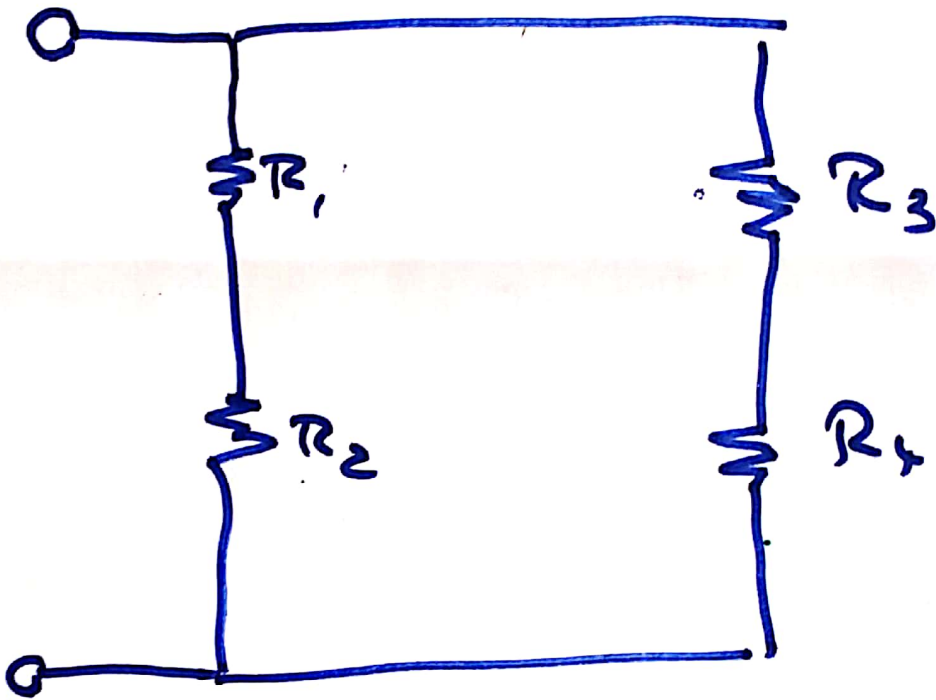


$$I_t = \frac{V_t}{R_1} + \frac{V_t}{R_2}$$

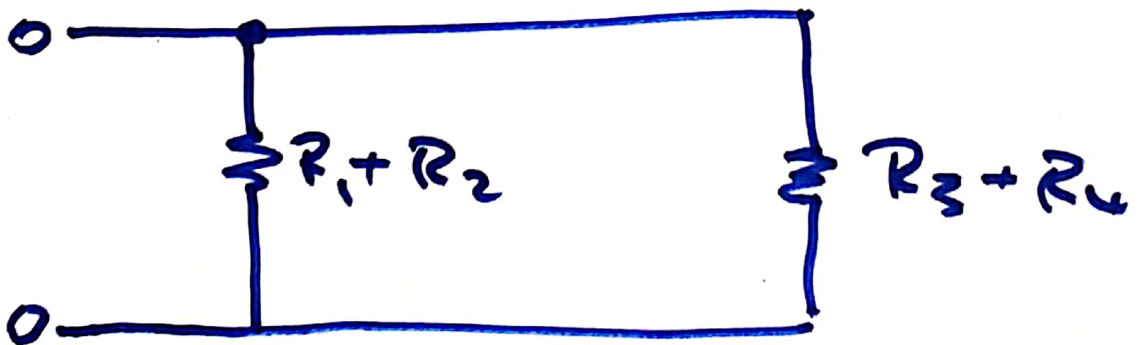
$$\frac{I_t}{V_t} = \left[ \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} \right]$$

$$R_{eq} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$
$$= R_1 \parallel R_2$$

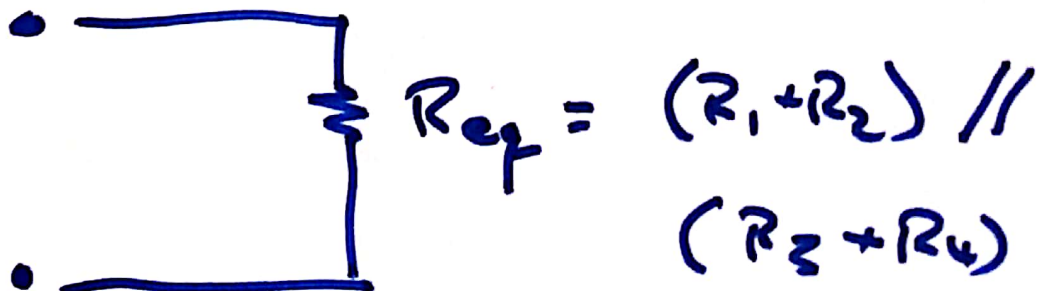
5



(1)



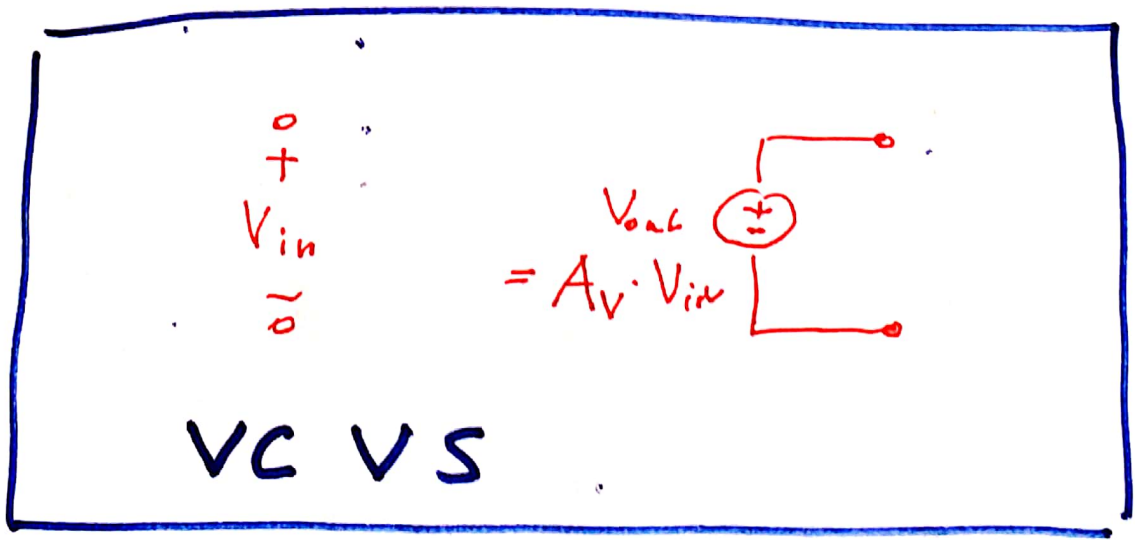
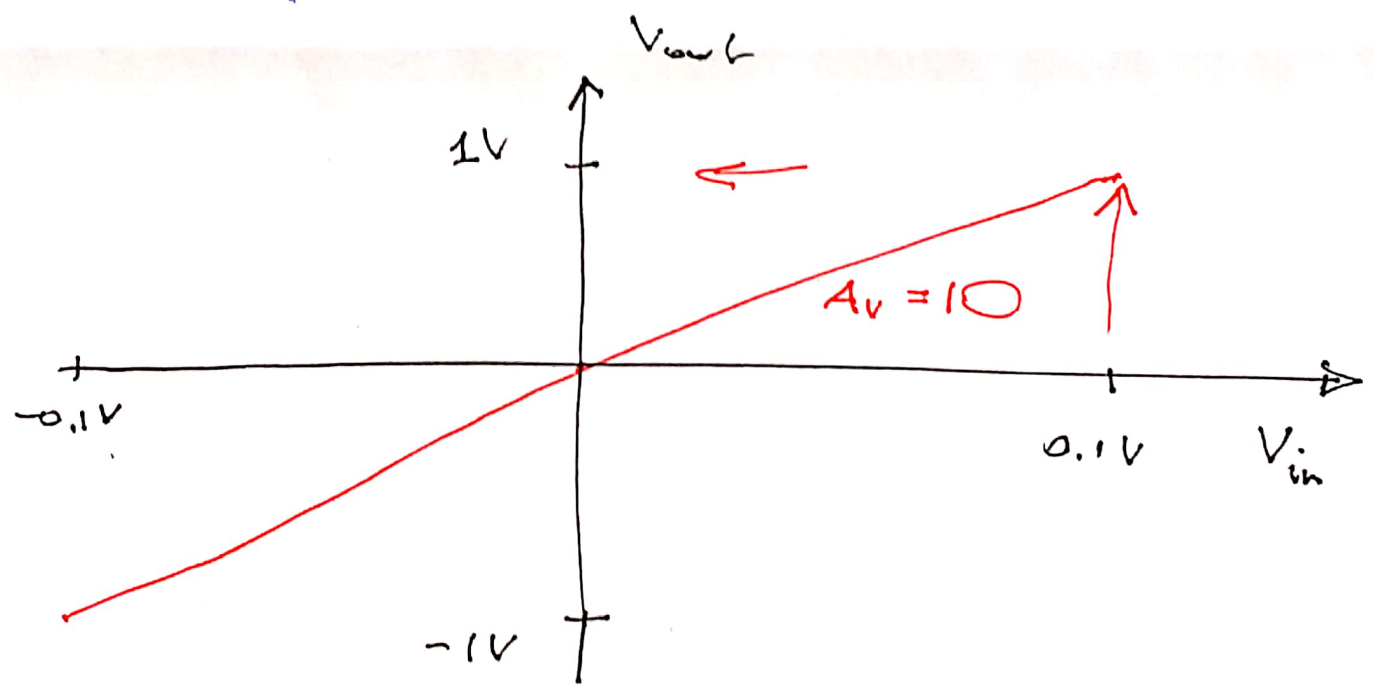
(2)



$$R_{eq} = (R_1 + R_2) \parallel (R_3 + R_4)$$

6

$$R_{eq} = \frac{(R_1 + R_2)(R_3 + R_4)}{R_1 + R_2 + R_3 + R_4}$$

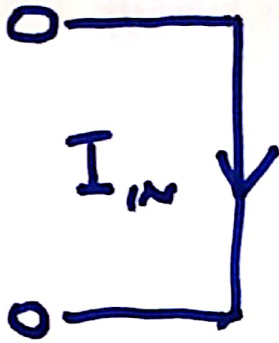


VCVS

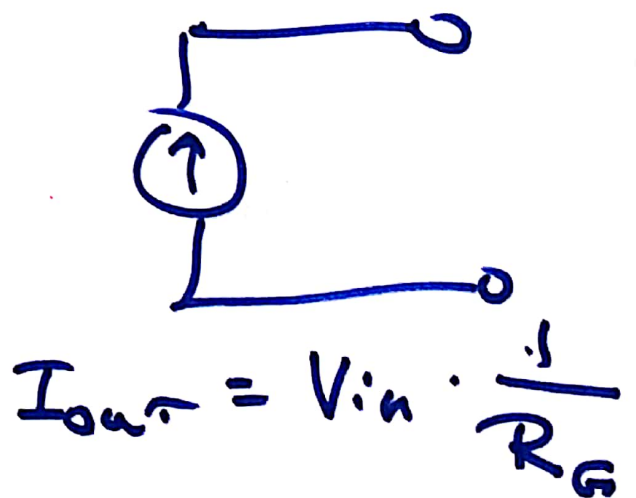
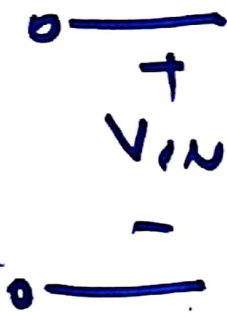
volt. controlled volt. source

CC VS

⑦

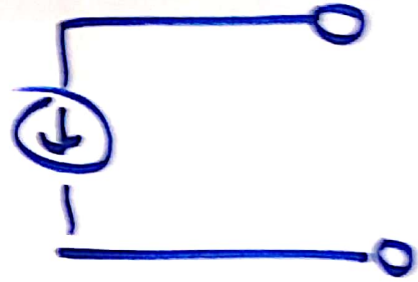
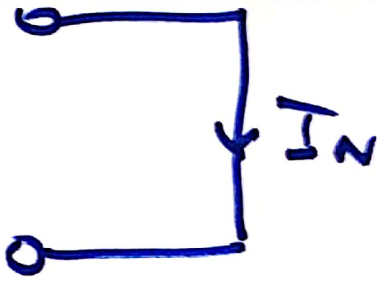


VC CS



CCCS

②



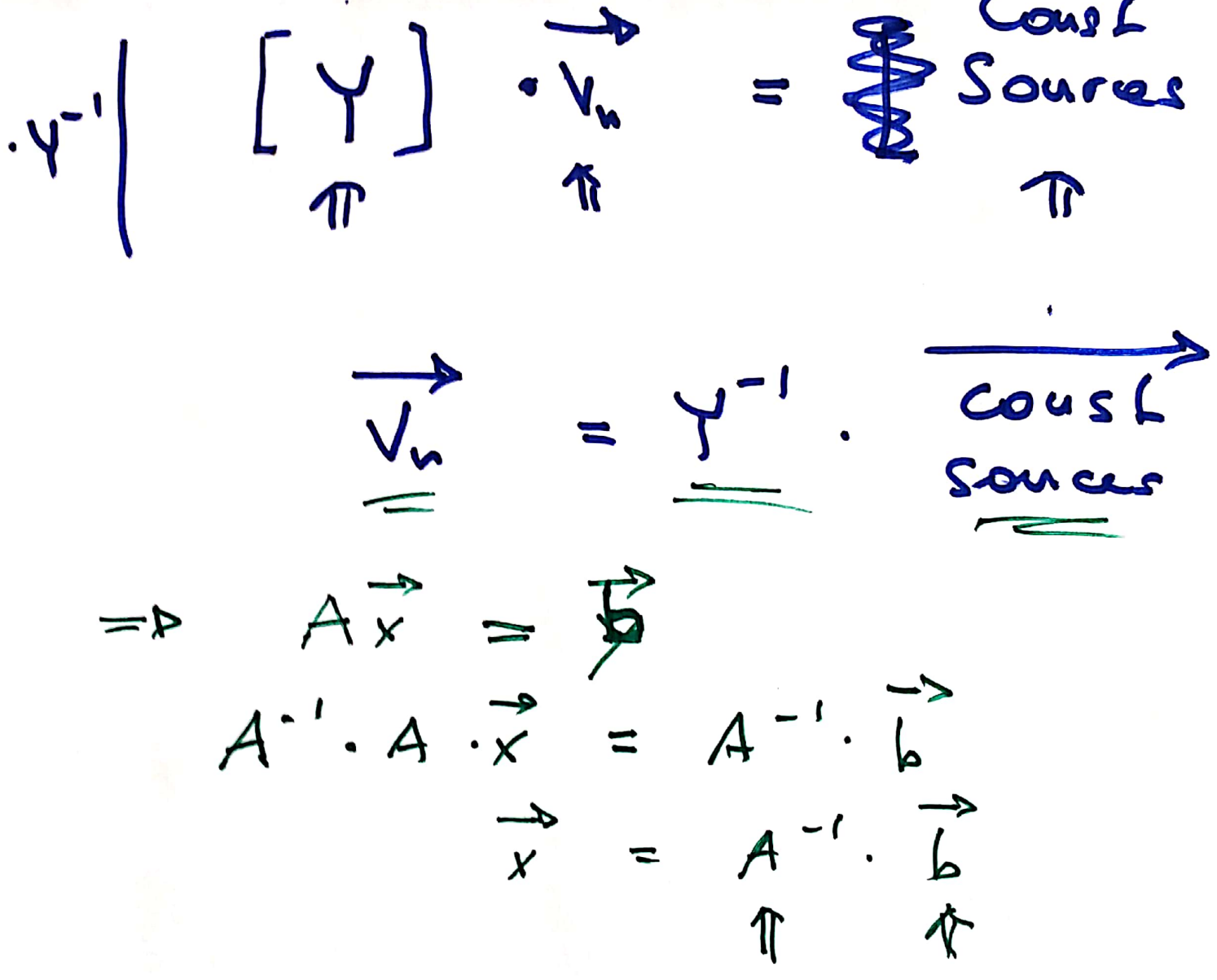
$$I_{out} = G_s I_N$$



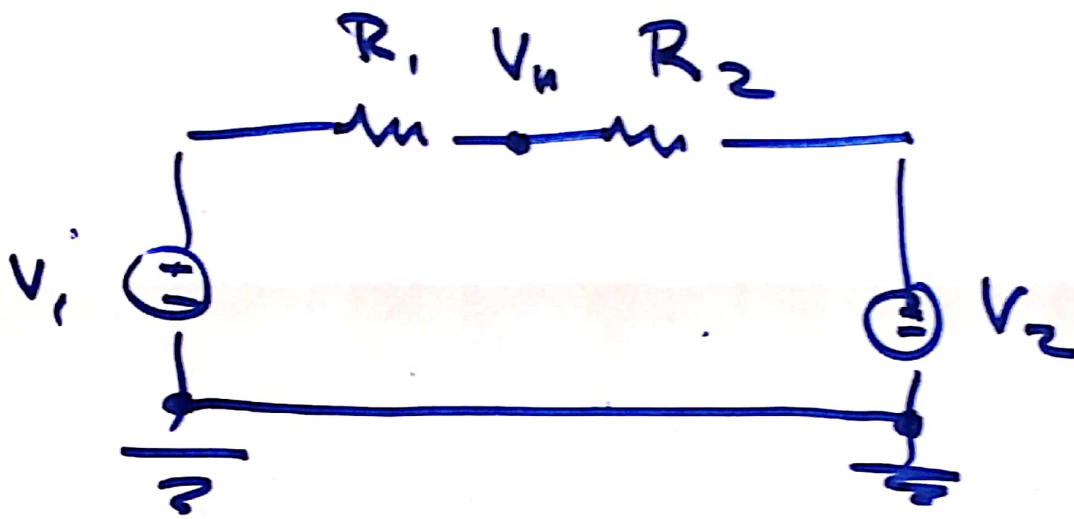
9

# Superposition

NVA:



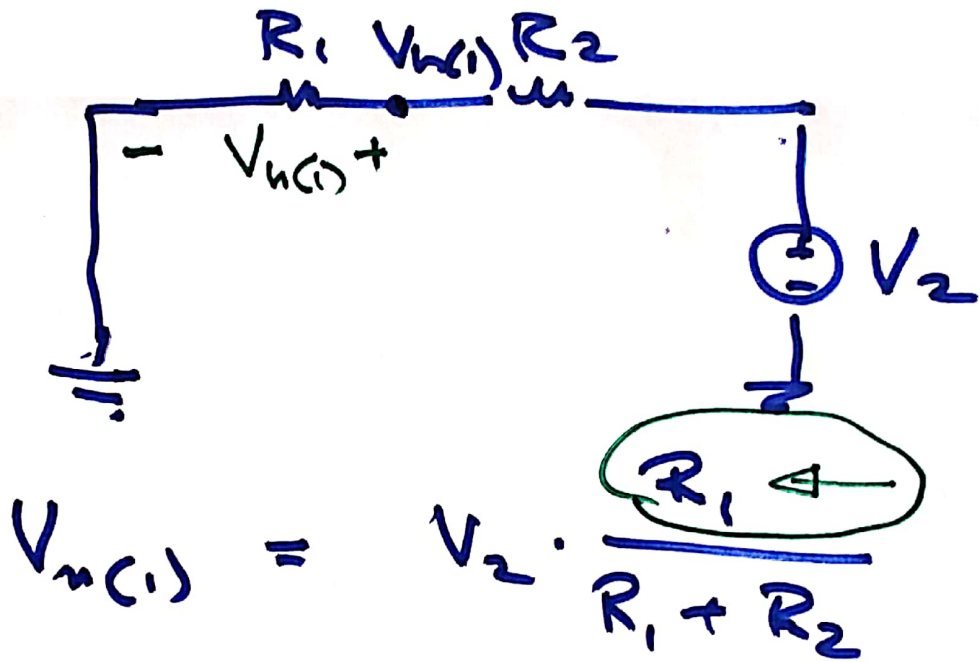
(10)



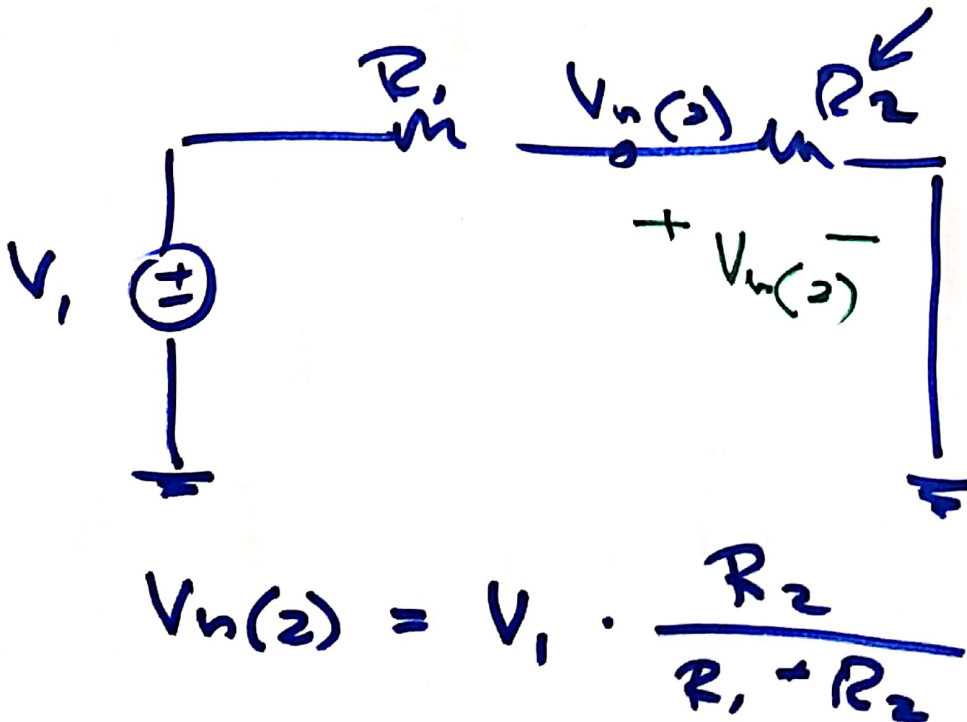
- 1) zero all sources except 1
- 2) repeat for diff. source
- 3) until all sources included
- 4) sum results

(11)

(1) zero  $V_1 = \emptyset$



(2) zero  $V_2 = 0$



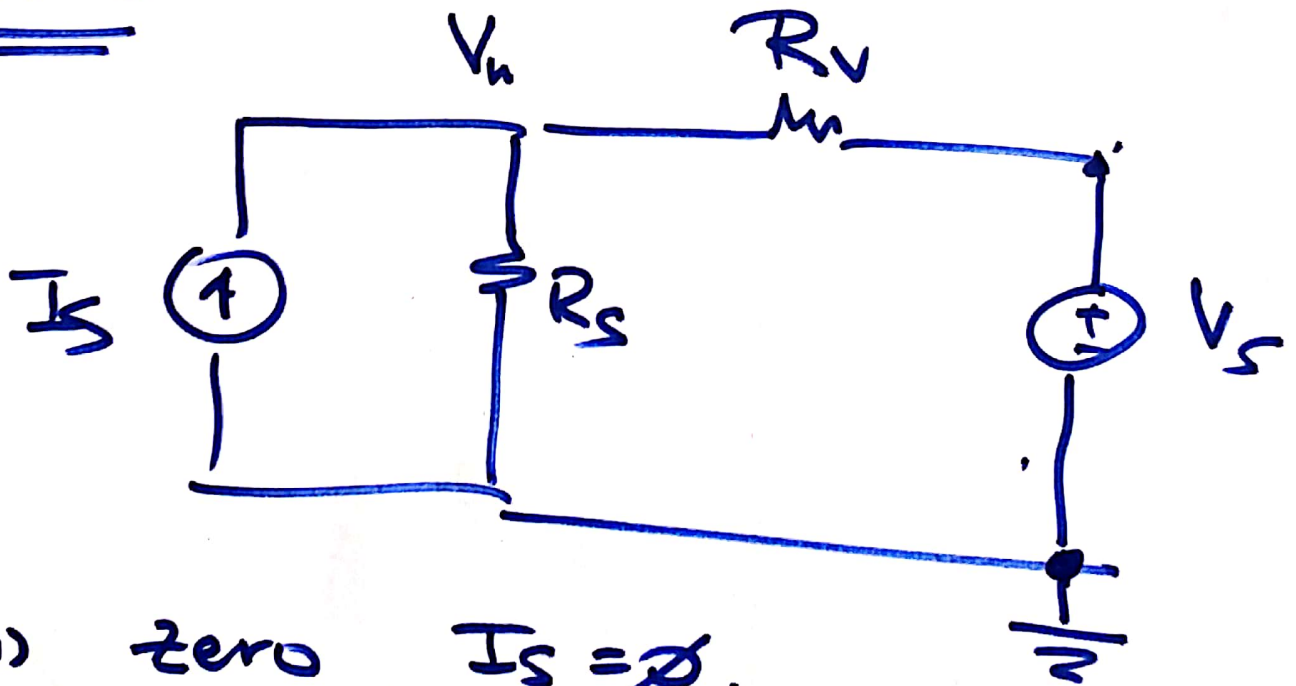
(12)

(3)

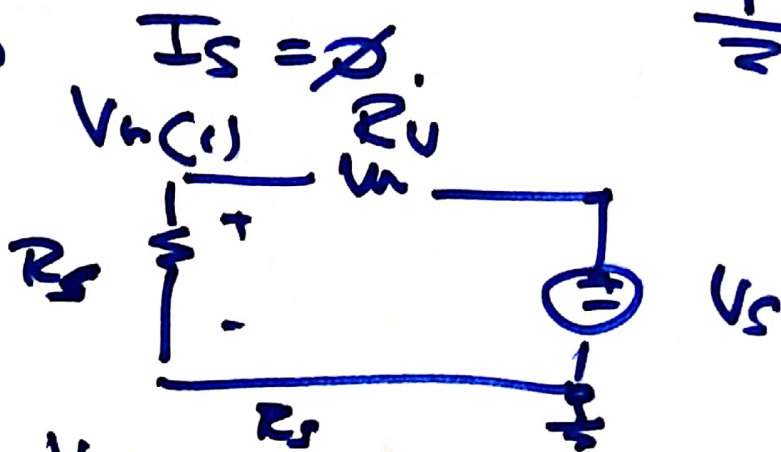
$$V_u = V_u(1) + V_u(2)$$

$$= \frac{V_1 \cdot R_2 + V_2 \cdot R_1}{R_1 + R_2}$$

Ex 2

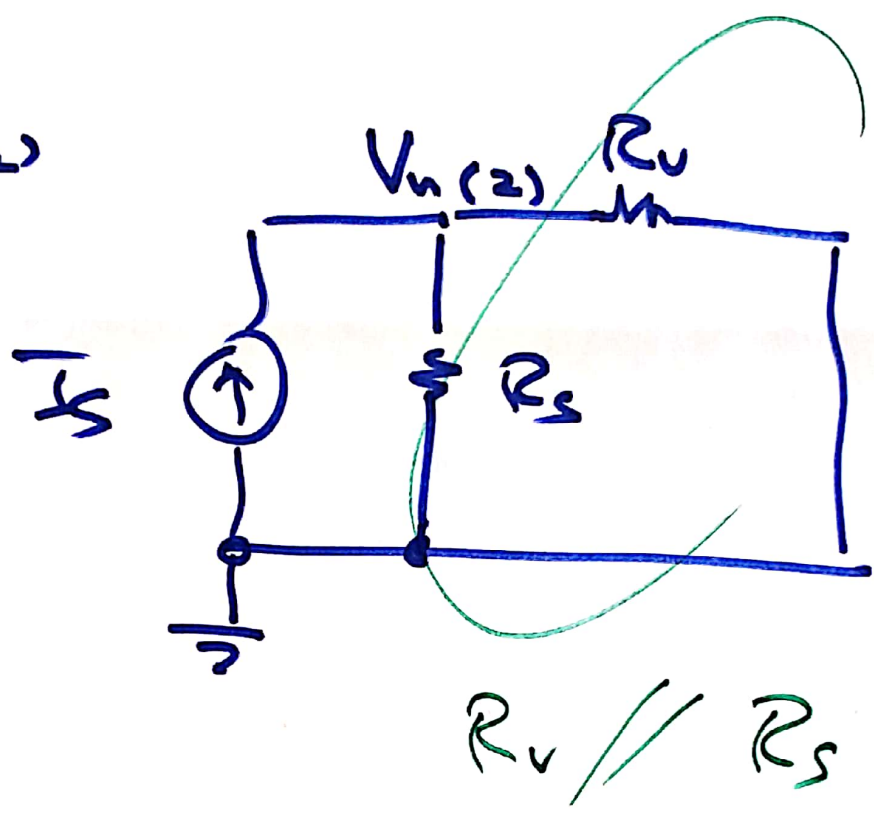


(i) zero



$$V_u(1) = V_s \cdot \frac{R_u}{R_s + R_u}$$

(2)



$R_v // R_s$

$\Rightarrow$

$V_v(2)$

...