

# ANNOUNCEMENTS

ACTUAL LAB NEXT WEEK

LAB VIEW

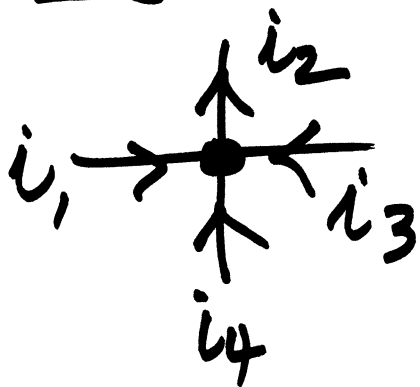
HW2 POSTED TODAY

# QUIZ RULES

- ① DO NOT SIT TOGETHER  
SIT AT LEAST ONE SEAT AWAY  
FROM OTHERS IN YOUR ROW
- ② CALCULATORS AVAILABLE.  
ASK!
- ③ PUT ANSWERS ON LINES OR  
IN BOXES INDICATED.
- ④ LATE/EXTENDED QUIZZES  
ROCKEFELLER 304
- ⑤ PUT QUIZZES IN BOXES  
ACCORDING TO LAB DAY

# Kirchoff's Current Law (KCL)

algebraic sign

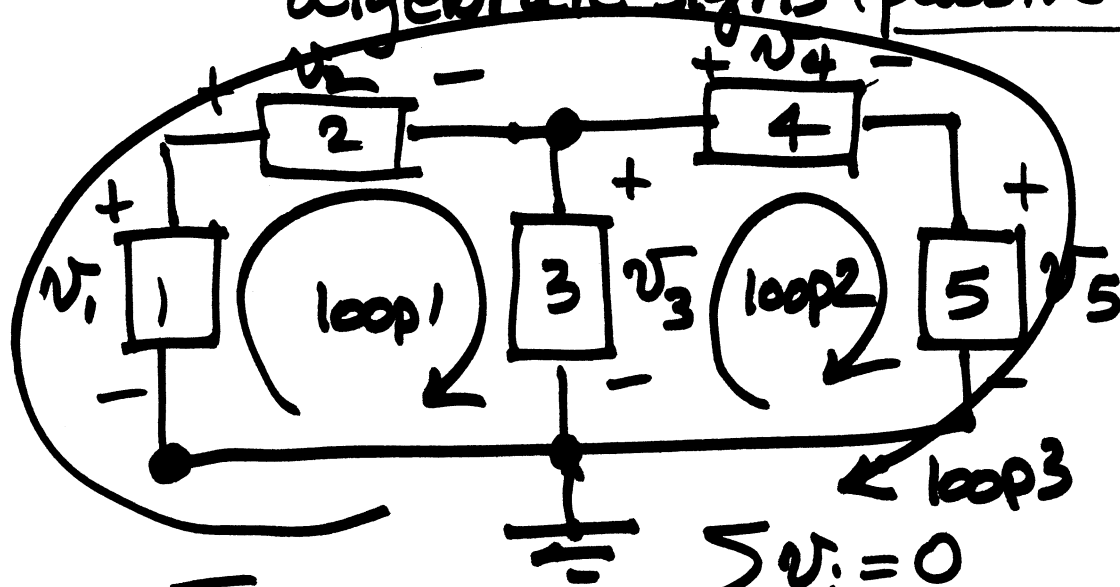


$$\sum_i i_i = 0$$

$$i_1 - i_2 + i_3 + i_4 = 0$$

# Kirchoff's Voltage Law (KVL)

algebraic signs (passive sign conv.)



$$\sum_j v_j = 0$$

$$\sum_{loop} v_j = 0$$

loop  $j$

loop1:  $-v_1 + v_2 + v_3 = 0$

loop2:  $-v_3 + v_4 + v_5 = 0$

loop3:  $-v_1 + v_2 + v_4 + v_5 = 0$

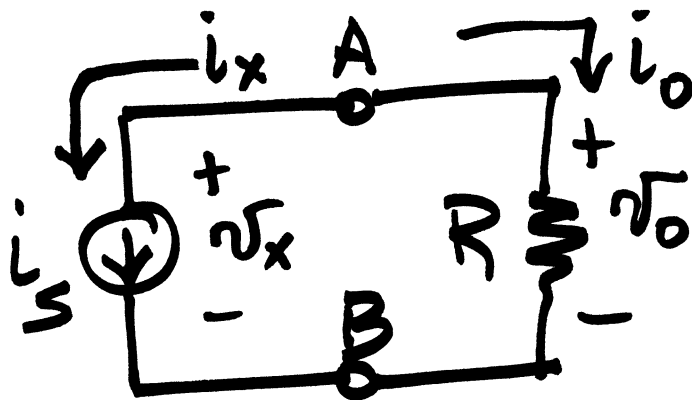
## Combined constraints

- elements  $\left\{ \begin{array}{l} \text{resistors (Ohm's Law)} \\ \text{voltage sources} \\ \text{currents} \end{array} \right.$

- connection eqms: KCL, KVL

FIRST

- label all elements according to passive sign convention



element constraints

$$i_x = i_s$$

$$v_o = i_o R$$

connection eqms:

KCL (2 nodes): node A  $\sum i = 0$

$$+ \text{out.}$$

$$+ i_x + i_o = 0$$

$$i_x = -i_o$$

KVL (1 loop):  $\sum v = 0$

$$-v_x + v_o = 0$$

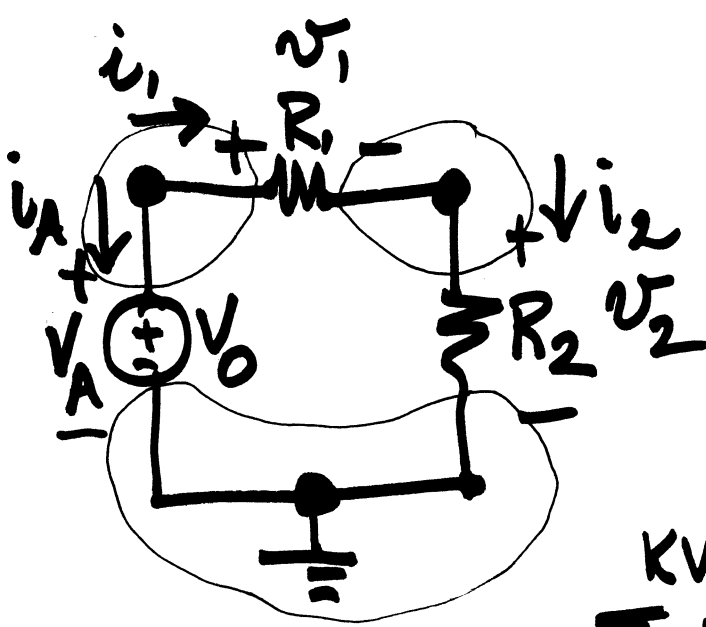
$$v_x = v_o$$

connection		element
$i_x = -i_o$	←	$i_x = i_s$
$v_x = v_o$	←	$v_o = i_o R$

given  $i_s, R \rightarrow$  know  $i_x$

$$i_x = -i_o \Rightarrow i_o = -i_x = -i_s$$

$$v_x = v_o = i_o R = -i_s R$$



element:  
 $v_1 = i_1 R_1$   
 $v_2 = i_2 R_2$   
 $V_A = V_0$

connection:

KVL  
 $\sum v_j$   
 $-V_A + v_1 + v_2 = 0$

KCL:  $\sum_{\text{tot}} i = 0$      $+i_A + i_1 = 0$

$\sum_{\text{tot}} i = 0$      $-i_1 + i_2 = 0$