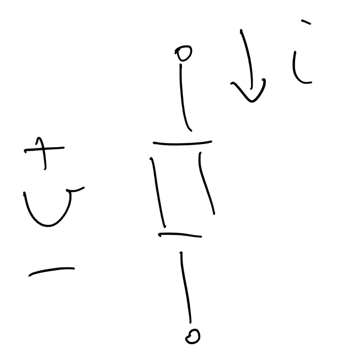
16B circuits review (16A)

Thursday, August 27, 2020 10:25 AM

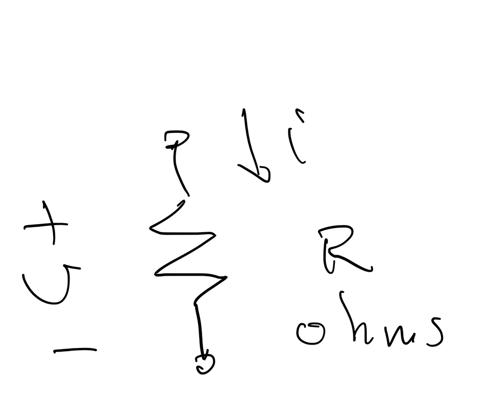
Element



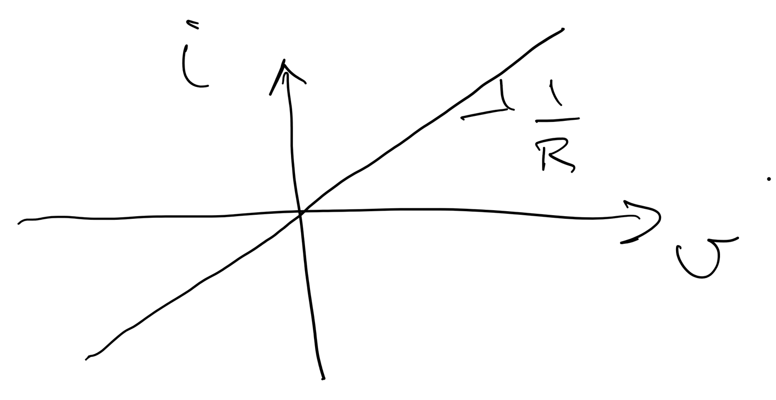
i = Amps
v = Volts

$v \cdot i$ = power into element

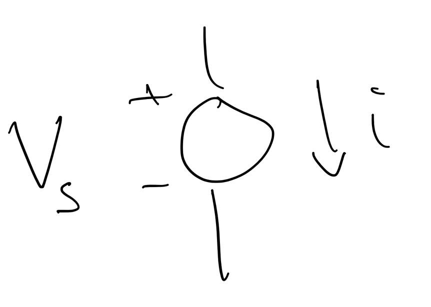
Resistor

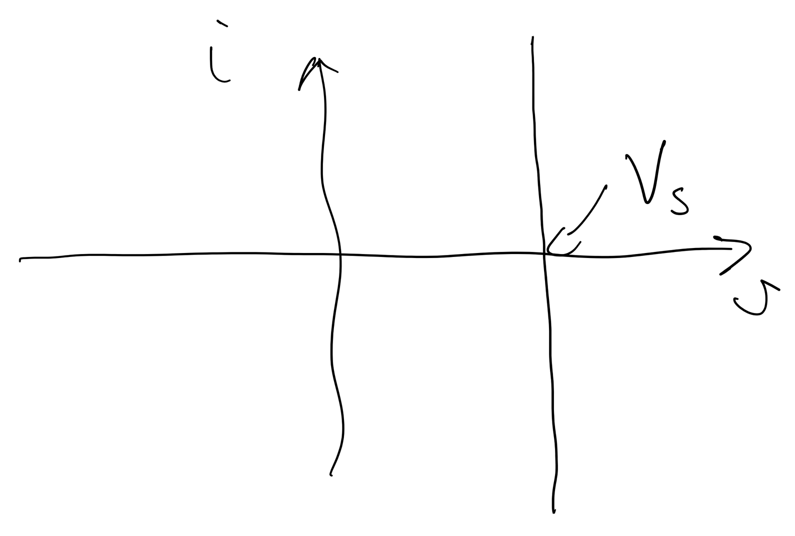


$v = Ri$
$i = \frac{1}{R} v = Gv$
mhos

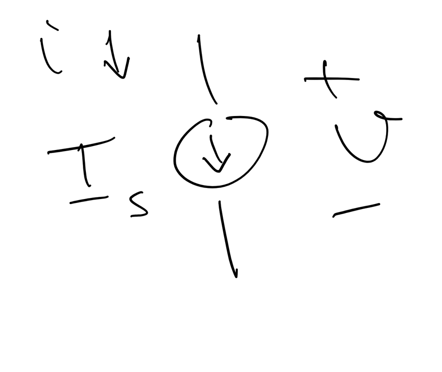


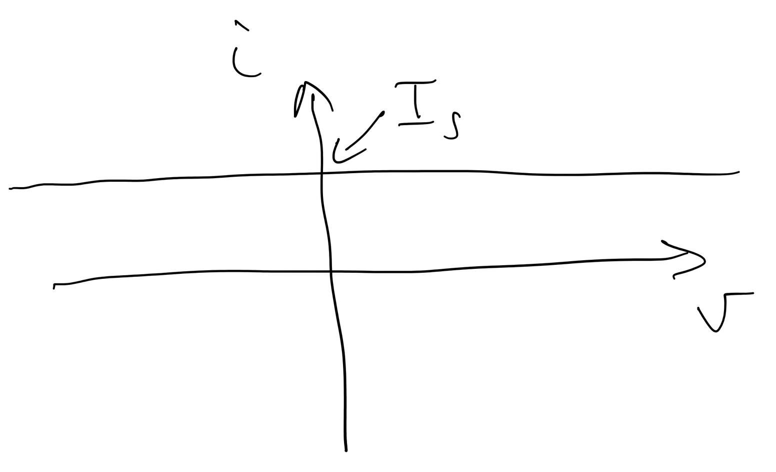
Volt. Source



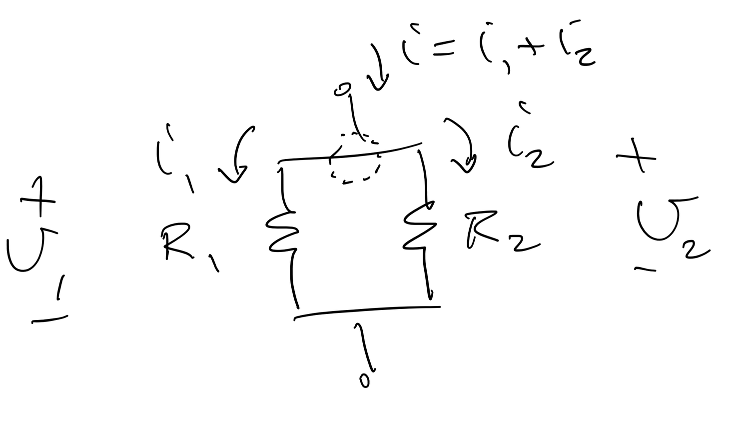


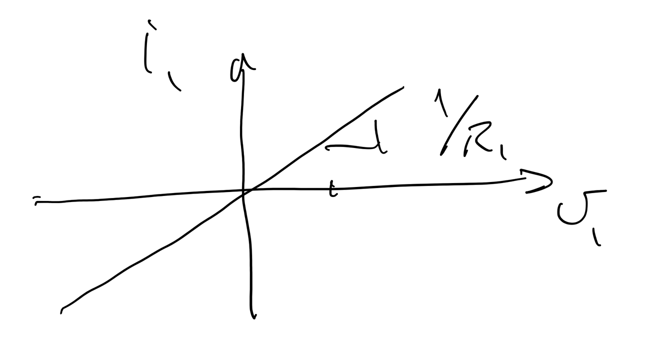
Current Source



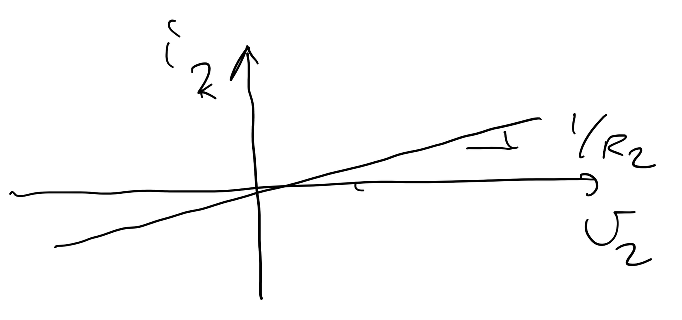


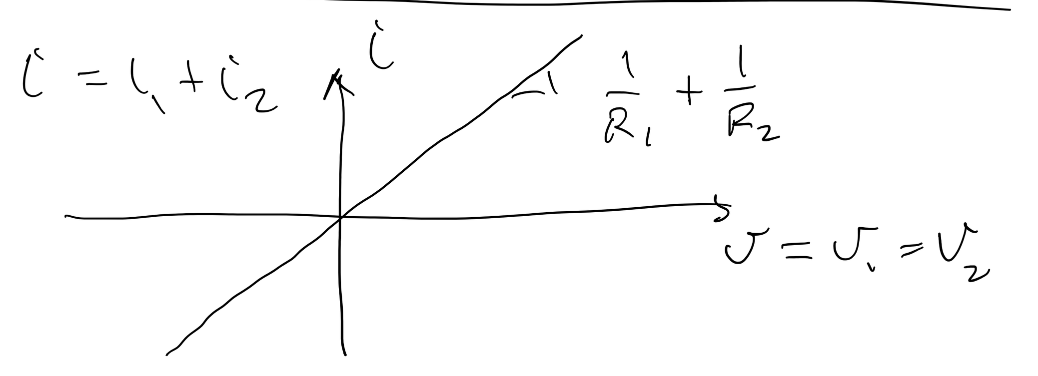
Parallel R's





(+)



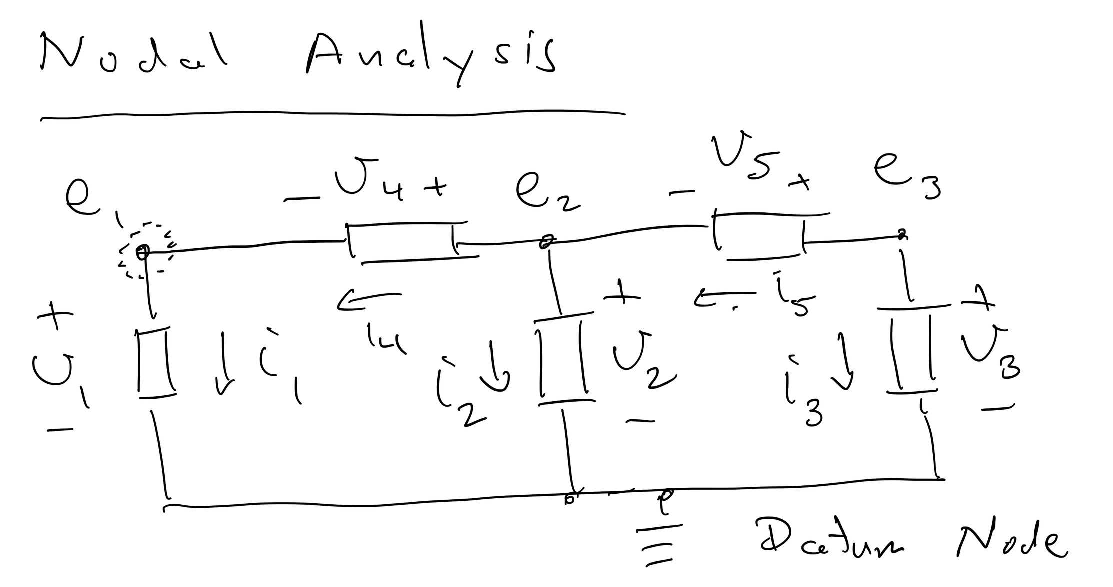


$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

Ckt Analysis

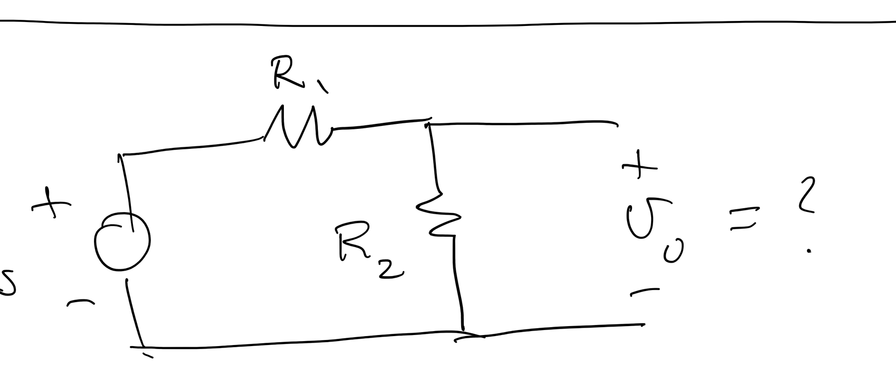
KVL
KCL

Nodal Analysis



- If we know e_1, e_2, e_3 ⇒ know all branch voltages
  $v_4 = e_2 - e_1$
- Would like to bring in KCL constraints to help solve. With nodal analysis, bring in constitutive relations to expedite form of node eqns.

Nodes			
①	i_1	$-i_4$	$= 0$
②	i_2	$+i_4 - i_5$	$= 0$
③	i_3	$+i_5$	$= 0$

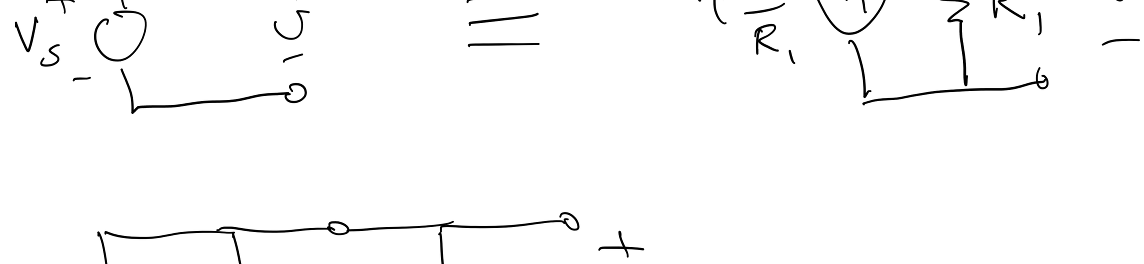


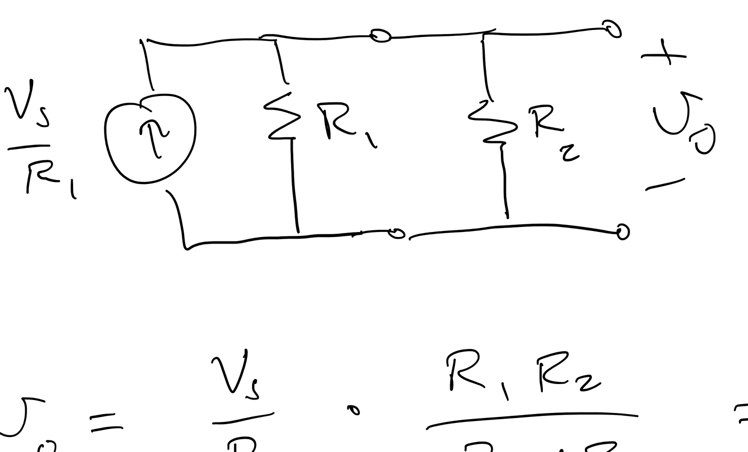
How to analyze?

1) Already know this is a voltage divider

$$v_o = \frac{R_2}{R_1+R_2} V_s$$

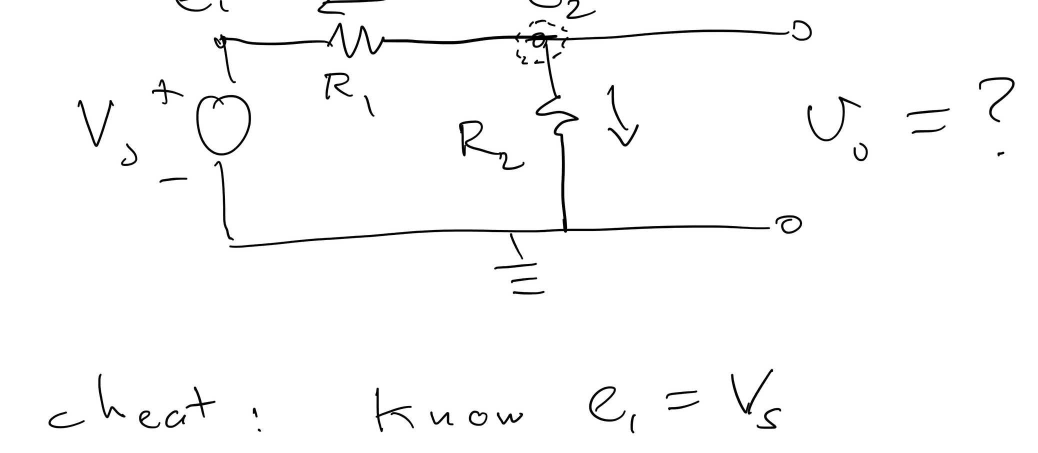
2) Thevenin / Norton Eq. Ckts





$$v_o = \frac{V_s}{R_1} \cdot \frac{R_1 R_2}{R_1 + R_2} = V_s \frac{R_2}{R_1+R_2}$$ ✓

③ Node Analysis



cheat: know $e_1 = V_s$

Node ②: $$\frac{e_2}{R_2} + \frac{e_2 - V_s}{R_1} = 0$$

solve ⇒ $e_2 = v_o$