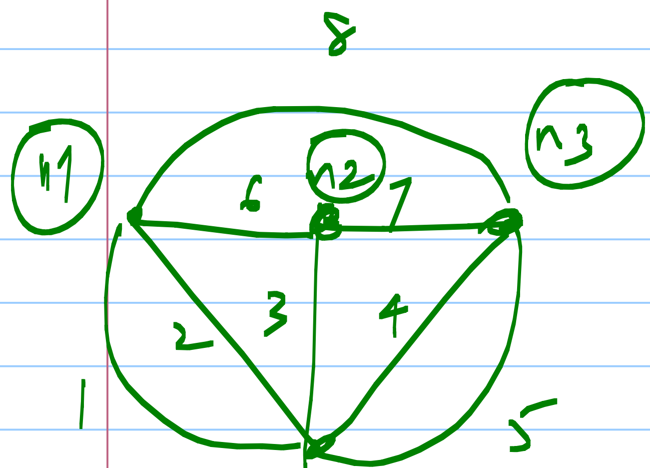
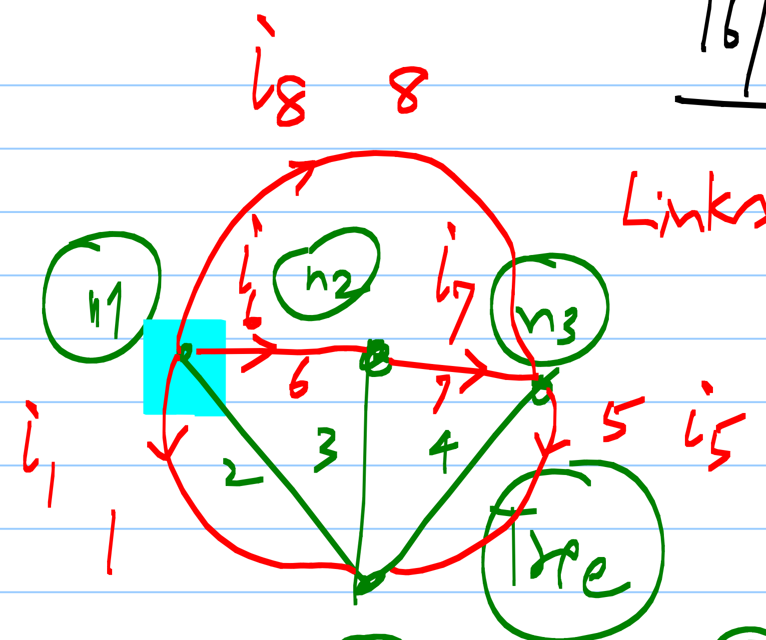
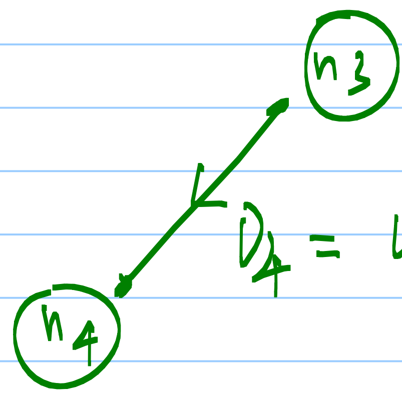
EE 2015

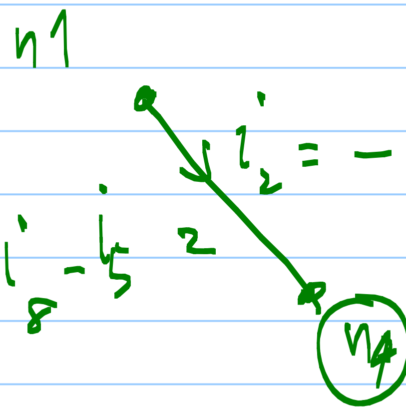
16/8/2017



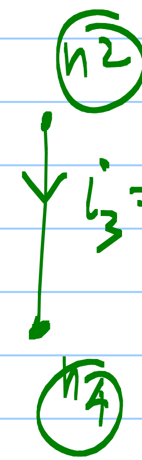




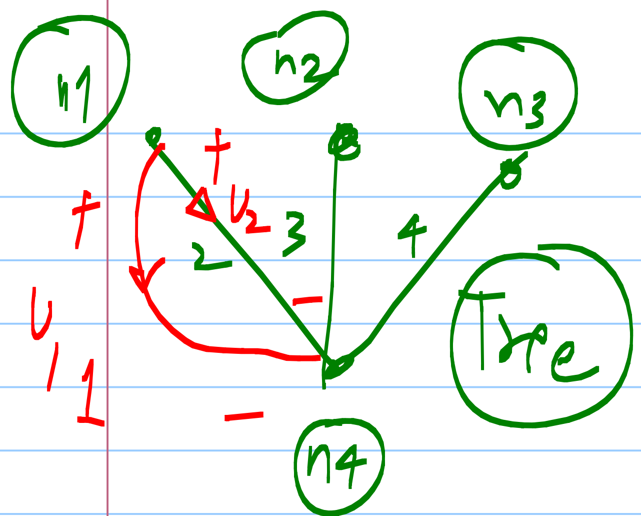
$i_4 = i_7 + i_8 - i_5$



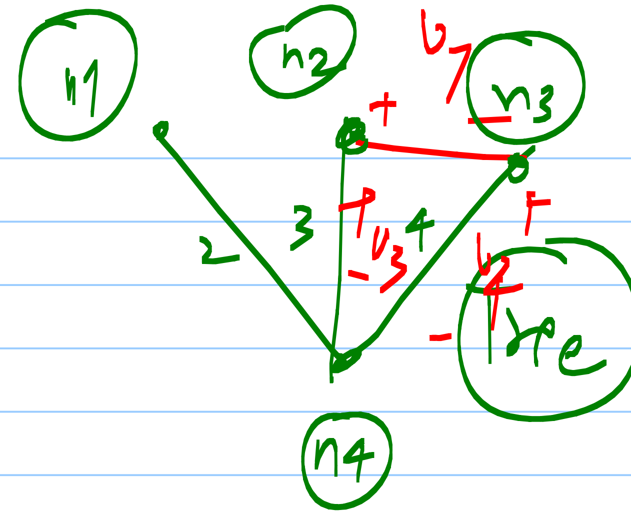
$i_2 = -i_1 - i_6 - i_8$



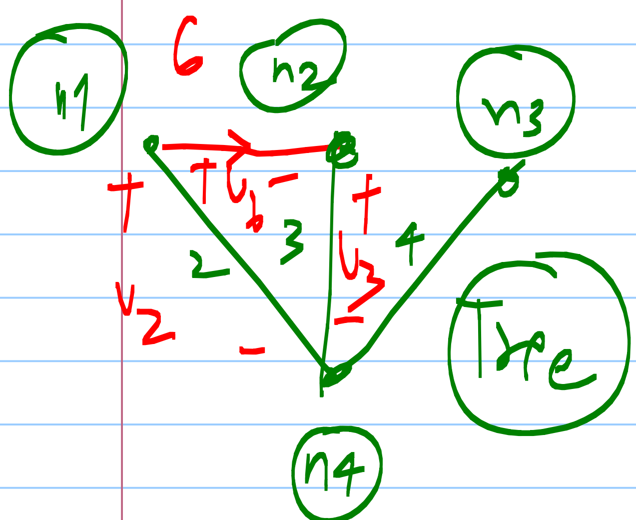
$i_3 = i_6 - i_7$



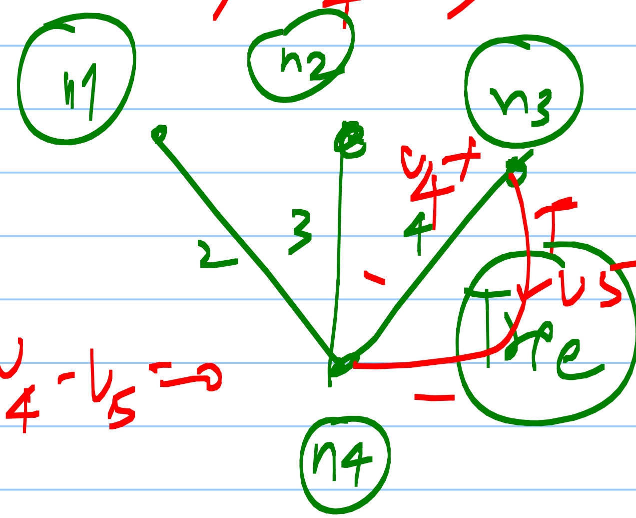
$v_1 - v_2 = 0$



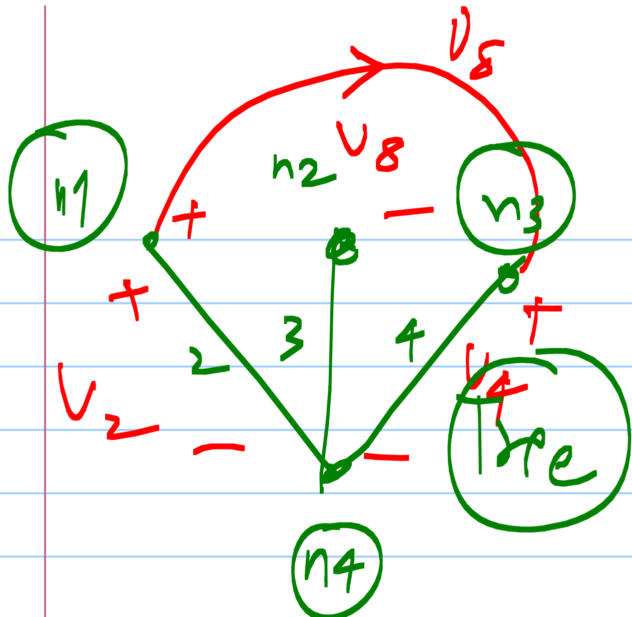
$v_7 + v_4 - v_3 = 0$



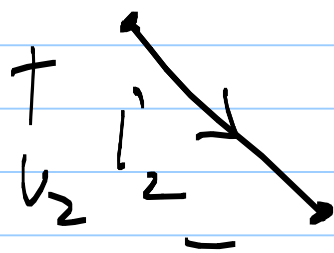
$v_6 + v_3 - v_2 = 0$



$v_4 - v_5 = 0$



$v_8 + v_4 - v_2 = 0$



v_1 [illegible] $= 0$

$v_6 + v_3 -$ [illegible] $= 0$

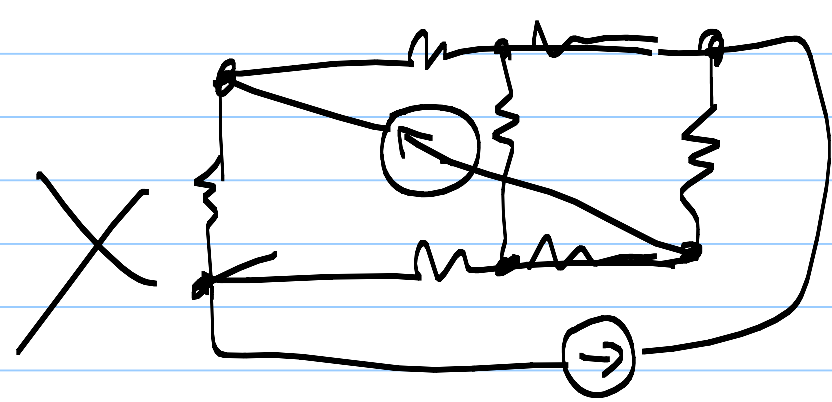
$v_7 + v_4 - v_3 = 0$

$v_4 - v_5 = 0$

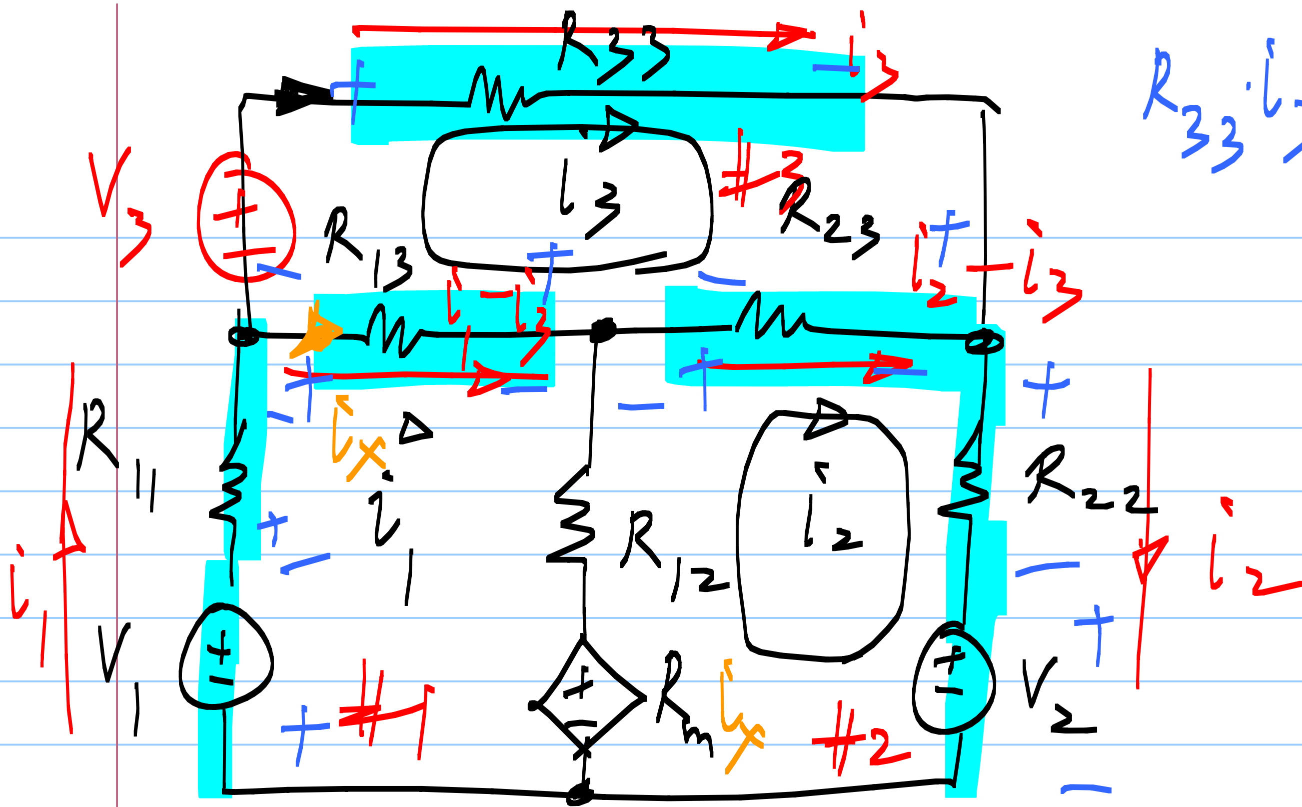
$v_8 + v_4 -$ [illegible] $= 0$

$[R]\,\underline{i} = \underline{V_s}$

Mesh analysis: Loop-based analysis for planar circuits



Circuits which can be drawn on a plane without two branches crossing over each other



$R_{33} i_3 + R_{23}(i_3 - i_2)$

$+ R_{13}(i_3 - i_1) = 0$

$- R_m(i_1 - i_3)$

$R_{13}(i_1 - i_3) + R_{12}(i_1 - i_2) + R_{11} i_1 = V_1 - ~~R_m i_3~~$

$R_{12}(i_2 - i_1) + R_{23}(i_2 - i_3) + R_{22} i_2 = -V_2 + ~~R_m i_3~~$

$+ R_m(i_1 + i_3)$

Mesh #1 $(R_{11}+R_{12}+R_{13})i_1 - R_{12}i_2 - R_{13}i_3 = V_1$

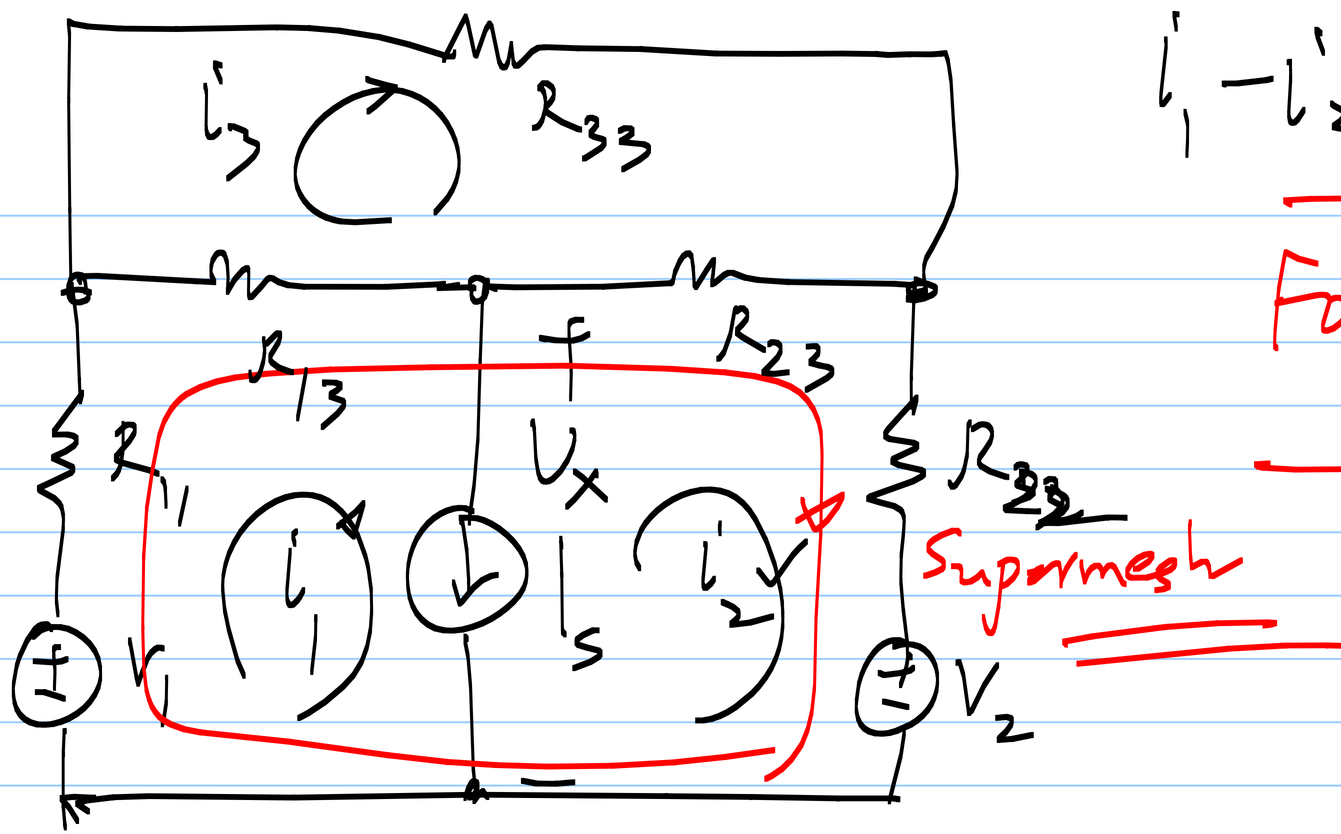
Mesh #2 $-R_{12}i_1 + (R_{12}+R_{22}+R_{23})i_2 - R_{23}i_3 = -V_2$

Mesh #3 $-R_{13}i_1 - R_{23}i_2 + (R_{13}+R_{23}+R_{33})i_3 = 0$

$$[R]\,\underline{i} = \underline{V_s}$$

$$\begin{bmatrix} R_{11}+R_{12}+R_{13} & -R_{12} & -R_{13}+R_m \\ -R_{12} & R_{12}+R_{22}+R_{23} & -R_{23}-R_m \\ -R_{13} & -R_{23} & R_{13}+R_{23}+R_{33} \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} V_1 - V_x \\ -V_2 + V_x \\ V_3 \end{bmatrix}$$

$$
\begin{bmatrix}
R_{11}+R_{12}+R_{13}+R_m & -R_{12} & -R_{13}-R_m \\
-R_{12}-R_m & R_{12}+R_{22}+R_{23} & -R_{23}+R_m \\
-R_{13} & -R_{23} & R_{13}+R_{23}+R_{33}
\end{bmatrix}
\begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix}
=
\begin{bmatrix} V_1 \\ -V_2 \\ 0 \end{bmatrix}
$$



$i_1 - i_2 = I_s$

Form a supermesh

$(R_{11} + R_3)\, i_1 - R_3 \cdot i_3 - V_x = V_1$

$V_x + (R_{22} + R_{23})\, i_2 - R_{23} \cdot i_3 = V_2$