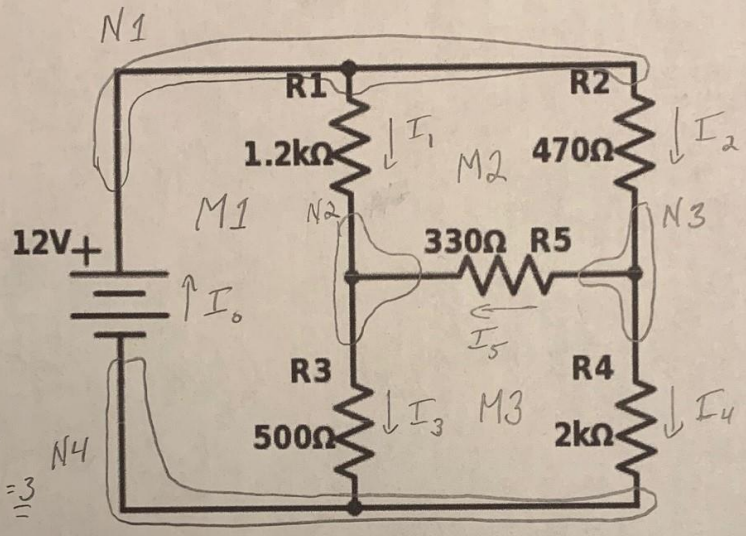
EN-3212 Electronics Worksheet 5

Node Mesh

Let's try this again. Be sure to follow all of the steps outlined above.



Only need N-1 node eqns $4-1=3$

Equations

N1: $I_0 = I_1 + I_2$

$I_0 - I_1 - I_2 = 0A$

N2: $I_1 + I_5 = I_3$

$I_1 - I_3 + I_5 = 0A$

N3: $I_2 = I_4 + I_5$

$I_2 - I_4 - I_5 = 0A$

N4: $I_3 + I_4 = I_0$

$-I_0 + I_3 + I_4 = 0A$

use

M1: $-I_1 R_1 - I_3 R_3 + V_s = 0V$

$I_1 R_1 + I_3 R_3 = V_s$

M2: $-I_2 R_2 - I_5 R_5 + I_1 R_1 = 0V$

$I_1 R_1 - I_2 R_2 - I_5 R_5 = 0V$

M3: $I_5 R_5 - I_4 R_4 + I_3 R_3 = 0V$

$I_3 R_3 - I_4 R_4 + I_5 R_5 = 0V$

Matrix →

	I_0	I_1	I_2	I_3	I_4	I_5	Ans
N1	1	-1	-1	0	0	0	0
N2	0	1	0	-1	0	1	0
N3	0	0	1	0	-1	-1	0
M1	0	R_1	0	R_3	0	0	V_s
M2	0	R_1	$-R_2$	0	0	$-R_5$	0
M3	0	0	0	R_3	$-R_4$	R_5	0

Voltages

$V_1 = I_1 R_1 = 6.42V$

$V_2 = I_2 R_2 = 4.50V$

$V_3 = I_3 R_3 = 5.59V$

$V_4 = I_4 R_4 = 7.50V$

$V_5 = I_5 R_5 = 1.92V$

Results

$I_0 = 14.92mA$

$I_1 = 5.35mA$

→ $I_2 = 9.57mA$

$I_3 = 11.17mA$

$I_4 = 3.75mA$

$I_5 = 5.82mA$