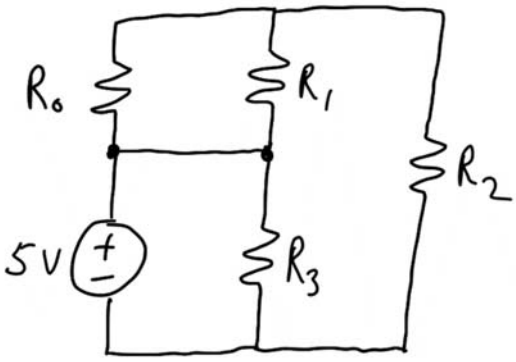
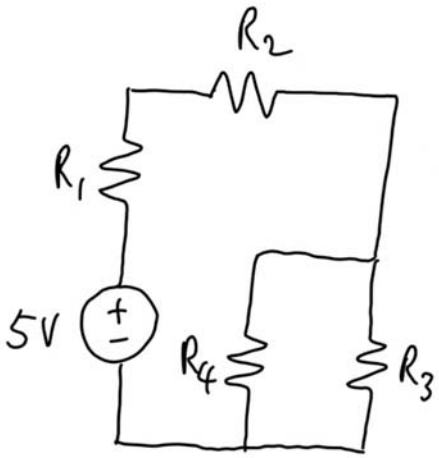
Some Extra Questions for Practicing Node Voltage Analysis Method

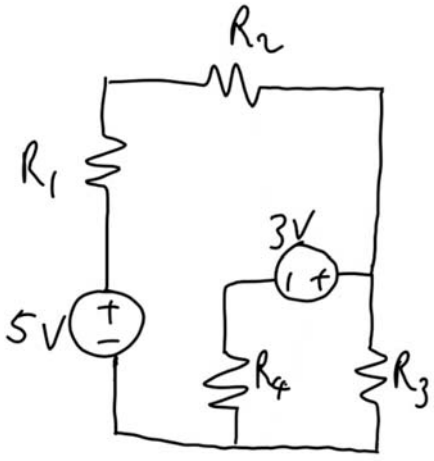
1)



2)

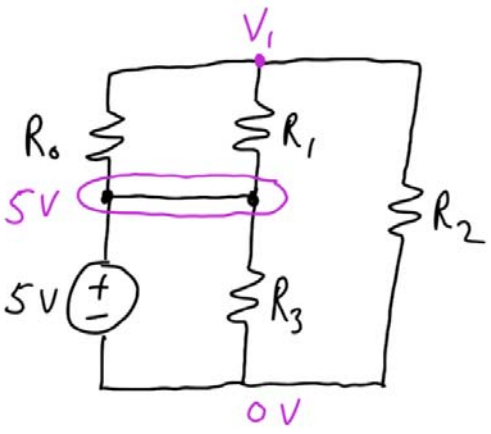


3)



Solutions:

1)

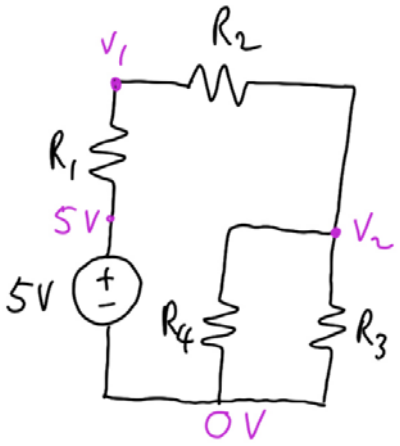


$$\frac{V_1-5}{R_0}+\frac{V_1-5}{R_1}+\frac{V_1-0}{R_2}=0$$

Extracting coefficients of V_1 and constants:

$$\left(\frac{1}{R_0}+\frac{1}{R_1}+\frac{1}{R_2}\right)V_1=5\left(\frac{1}{R_0}+\frac{1}{R_1}\right)$$

2)



$$\frac{V_2-V_1}{R_2}+\frac{V_2}{R_3}+\frac{V_2}{R_4}=0$$

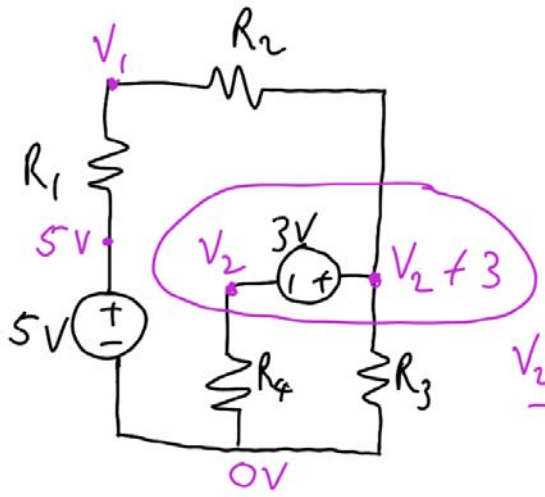
$$\frac{V_1-V_2}{R_2}+\frac{V_1-5}{R_1}=0$$

Extracting coefficients of V_1 & V_2 as well as constants to form simultaneous equations:

$$-\frac{1}{R_2}V_1+\left(\frac{1}{R_2}+\frac{1}{R_3}+\frac{1}{R_4}\right)V_2=0$$

$$\left(\frac{1}{R_2}+\frac{1}{R_1}\right)V_1-\frac{1}{R_2}V_2=\frac{5}{R_1}$$

3)



$$\frac{V_1-5}{R_1}+\frac{V_1-(V_2+3)}{R_2}=0$$

$$\frac{V_2+3-V_1}{R_2}+\frac{V_2}{R_4}+\frac{V_2+3}{R_3}=0$$

Extracting coefficients of V_1 & V_2 as well as constants to form simultaneous equations:

$$\left(\frac{1}{R_1}+\frac{1}{R_2}\right)V_1+\left(-\frac{1}{R_2}\right)V_2=\frac{5}{R_1}+\frac{3}{R_2}$$

$$\left(-\frac{1}{R_2}\right)V_1+\left(\frac{1}{R_2}+\frac{1}{R_4}+\frac{1}{R_3}\right)V_2=-\frac{3}{R_2}-\frac{3}{R_3}$$