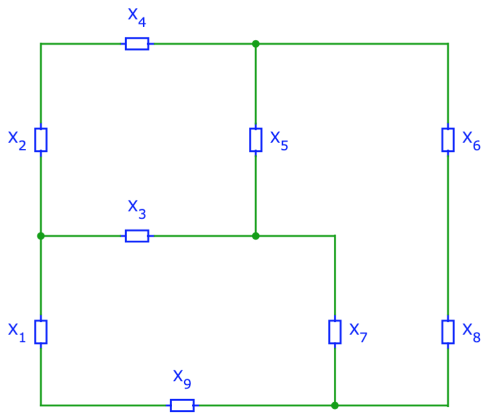
EECS 16A Designing Information Devices and Systems I
Fall 2021 Discussion 5A

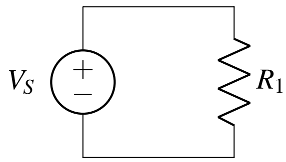
1. Label the circuit

In the circuit shown below, label all the nodes, and show one possible way of labeling all the element voltages and currents following the passive sign convention.



2. A Simple Circuit

For the circuit shown below, find the voltages across all the elements and the currents through all the elements.



(a) In the above circuit, pick a ground node. Does your choice of ground affect the voltage across and the current through elements?

(b) With your choice of ground, label the node potentials for every node in the circuit.

(c) Label all of the branch currents. Does the direction you pick matter?

(d) Draw the $+/-$ labels on every element. What convention must you follow?

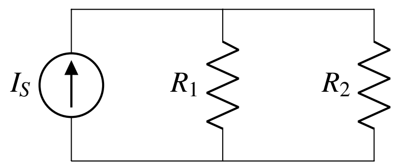
(e) Use KCL to find an equation for the unknown currents.

(f) Use KVL and Ohm's law to find two equations for the unknown node potentials and currents.

(g) Solve the system of equations if $V_S = 5\,\text{V}$ and $R_1 = 5\,\Omega$.

3. A Slightly More Complicated Circuit

For the circuit shown below, find the voltages across all the elements and the currents through all the elements.



(a) In the above circuit, pick a ground node. Does your choice of ground matter?

(b) With your choice of ground, label the node potentials for every node in the circuit.

(c) Label all of the branch currents. Does the direction you pick matter?

(d) Draw the $+/-$ labels on every element. What convention must you follow?

(e) Set up a matrix equation in the form $\mathbf{A}\vec{x} = \vec{b}$ to solve for the unknown node potentials and currents. What are the dimensions of the matrix $\mathbf{A}$? Hint: you don't need to fill out the elements of $\mathbf{A}$ or $\vec{b}$ in this part of the question.

(f) Use KCL to find as many equations as you can for the matrix.

(g) Use KVL and Ohm's law to find the remaining equations for the matrix.

(h) Solve the system of equations if $I_S = 5\,\text{A}$, $R_1 = 5\,\Omega$, and $R_2 = 10\,\Omega$.

