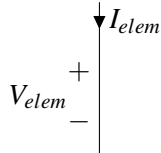# EECS 16A　Designing Information Devices and Systems I
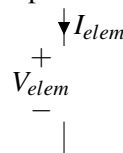## Spring 2023
Discussion 6A

1. Circuit Components and Ohm's Law

(a) We will look at the $I - V$ characteristics of different circuit components. For each of the components listed below, plot the $I_{elem} - V_{elem}$ characteristic curves.
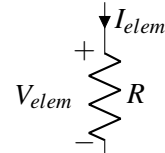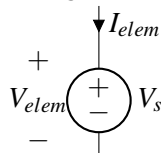
i. Wire

I_{elem}

$+$
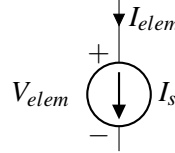
V_{elem}

$-$

ii. Open Circuit

I_{elem}

$+$

V_{elem}

$-$

iii. Resistor

I_{elem}

$+$

V_{elem}　R

$-$

iv. Voltage Source

I_{elem}

$+$

V_{elem} $\left(\overset{+}{\underset{-}{}}\right) V_s$

$-$

v. Current Source

I_{elem}

$+$

V_{elem} $\left(\downarrow\right) I_s$

$-$
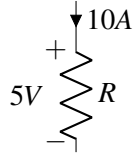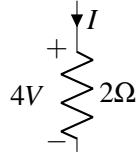
(b) Use Ohm's Law to find the missing component values in the circuits below. You may assume that each circuit is part of a larger circuit where there is a closed path for current to flow.
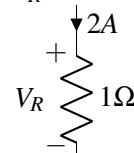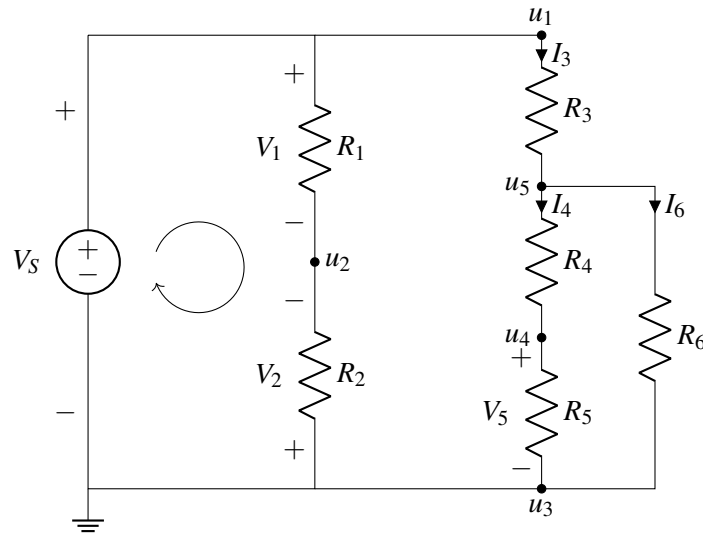
i. $R = ?$

$10A$

$+$

$5V$　R

$-$

ii. $I = ?$

I

$+$

$4V$　2Ω

$-$

iii. $V_R = ?$

$2A$

$+$

V_R　1Ω

$-$

2. **Passive Sign Convention and NVA Basics**

   The following question is a modified version of Spring 2022 Midterm 2 Question 1

   Suppose we have the following circuit:

   (a) Following passive sign convention, **label** the missing currents and the missing voltages for each element in the circuit, including the voltage source.

   (b) **Write the KCL expression** at node u_5 in terms of currents I_3, I_4, and I_6 as labeled in the circuit diagram.

   (c) Find the voltage across R_4, R_5, and R_6 in terms of the node voltages u_3, u_4, and u_5. Then use Ohm's law to express the currents across R_4, R_5, and R_6 in terms of node voltages and resistances.

   (d) **Write the KVL expression** for the loop drawn in the circuit diagram in terms of voltages V_S, V_1, and V_2.