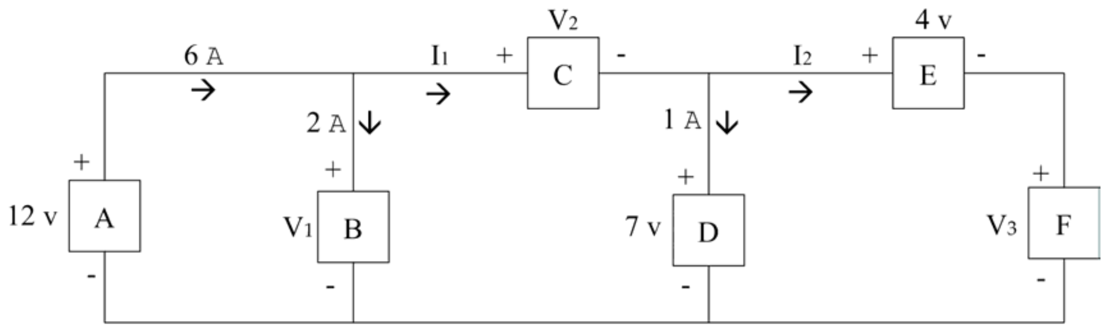
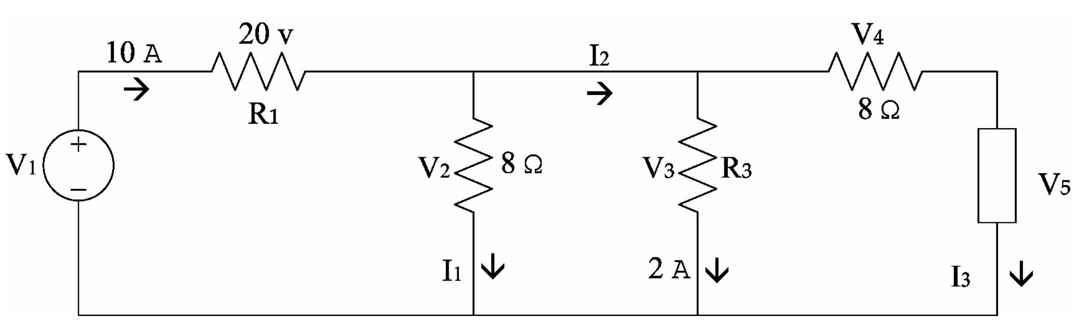
- ✓ Due at beginning of next class
- ✓ Start early so you have time to get help!
- ✓ Complete on separate paper
- ✓ LABEL EVERYTHING!
- ✓ Show all work
- ✓ Specify units
- ✓ Circle your answers



1. For the figure above, perform the following:
   a. Use Kirchoff's Current Law (KCL) to find I_1 and I_2.
   b. Use Kirchoff's Voltage Law (KVL) to find V_1, V_2, and V_3.
   c. Calculate power absorbed by each circuit element and perform a power balance check.

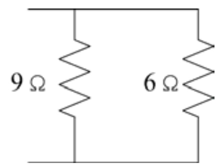


2. V_1 is providing 600 watts to the circuit shown above. Using KVL, KCL, Ohm's Law (OL), and Watt's Law (WL), label voltage reverences (+ and – polarity markers) for all circuit elements and solve for all unknown variables (V_1, V_2, V_3, V_4, V_5, I_1, I_2, I_3, R_1, R_3). Note which rule you are using for each calculation and perform a power balance check.

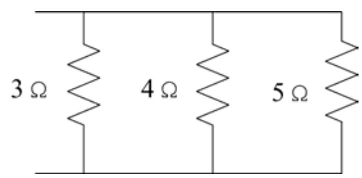
3. For the following figures, reduce the circuit using what you know about resistors in series and parallel. Redraw each in fully reduced form (a single resistor, or a single resistor and voltage source for d and e), and label the equivalent resistance of your result. Hint: Leave your calculator out of this one and solve these algebraically.

   a.

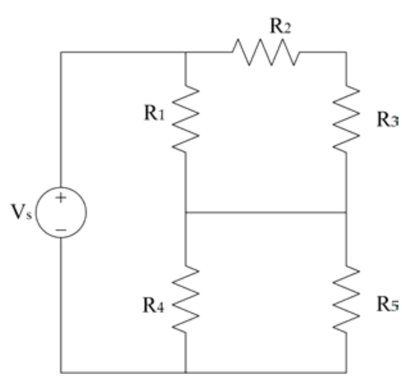
   b.



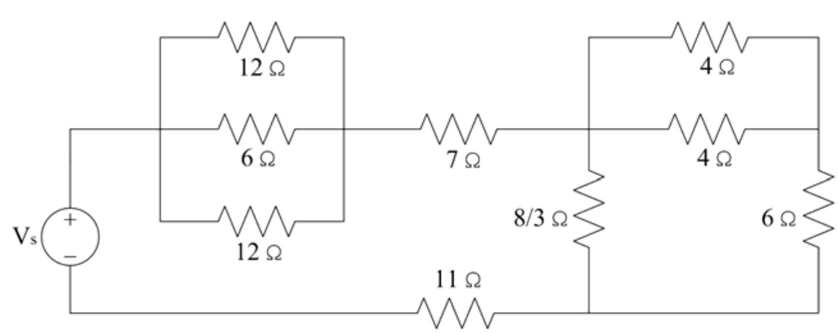
   c.

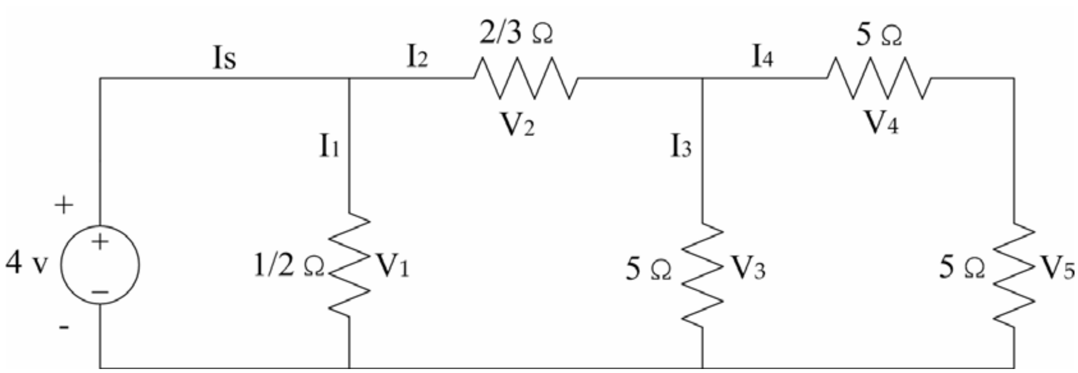


   d.



   e.





4. For the figure above, label current and voltage references (+ and – polarity markers for voltage and arrows for current). Calculate all unknown voltages and currents. Hint: Combine resistors until you can determine the value of Is (put away your calculator and use algebra!).

5. Perform the following unit conversions. Do it in steps and show your work. Express your answer both in decimal numbers (like this: 0.00001) and in scientific notation (like this: $1.0x10^{-6}$).
   a. 0.035 mV to Volts
   b. 273 KΩ to Ω
   c. 15 nF to μF (F is the abbreviation for Farads, our unit for measuring capacitance).
   d. 1725 mA to KA

continued next page >>

6. Resistors are small and would be difficult to label if not for a clever system. To determine the value of a resistor, we look at the colored stripes printed on it and use the universal Resistor Color Code to decipher the value. Each stripe's color corresponds to a number between 0 and 9 as listed below. The first two stripes designate the significant digits in the value – one stripe per digit (the decimal point is always after the second digit). The third stripe is a power of ten multiplier (a one here indicates multiplying the value by 10^1, a two means multiply by 10^2, and so on). The fourth stripe denotes the tolerance of the resistor (each resistor is quality rated for how close its actual value should be to the labeled value). For a handy chart refer to the instructions for Lab 2 on the instructor's web site.

   For example, "Red – Orange – Blue – Gold" translates to 23 x 10^6 with a +/- 5% tolerance, or 23,000,000Ω which is 23 MΩ. The tolerance factor means the resistor will be accurate within 5% of the labeled value, so the actual value may be anywhere between 21.85 MΩ and 24.15 MΩ

Resistor Color Code	
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

Tolerance	
Red	2 %
Gold	5 %
Silver	10 %

   Assume you have the following four resistors with the specified colored stripes. Convert the color code to the equivalent resistor value and tolerance, and calculate the range of expected actual values. (For a 5% tolerance, multiply the labeled value by .95 to get the minimum and by 1.05 to get the maximum.) Arrange your answers in table form.

   a. Brown – Black – Orange – Gold
   b. Yellow – Violet – Brown – Gold
   c. Brown – Green – Blue – Red
   d. Violet – Orange – Black – Silver