Basic Electronics (ECE113)
Tutorial 1

1. For the circuit of Fig. 1: -
   (*a*) Count the number of circuit elements.
   (*b*) If we move from *B* to *C* to *D*, have we formed a path? Have we formed a loop?
   (*c*) If we move from *E* to *D* to *C* to *B*, have we formed a path? Have we formed a loop?

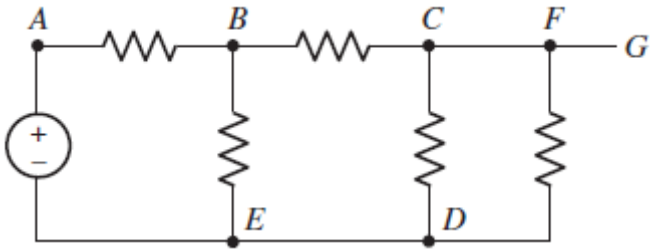


Fig. 1

2. Refer to the circuit of Fig. 2, and answer the following:
   (*a*) How many distinct nodes are contained in the circuit?
   (*b*) How many elements are contained in the circuit?
   (*c*) How many branches does the circuit have?
   (*d*) Determine if each of the following represents a path, a loop, both, or neither:

   (*i*) *A* to *B*
   (*ii*) *B* to *D* to *C* to *E*
   (*iii*) *C* to *E* to *D* to *B* to *A* to *C*
   (*iv*) *C* to *D* to *B* to *A* to *C* to *E*

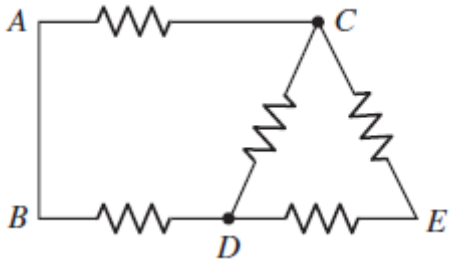
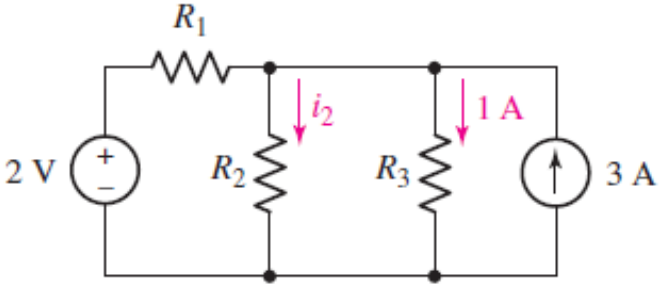
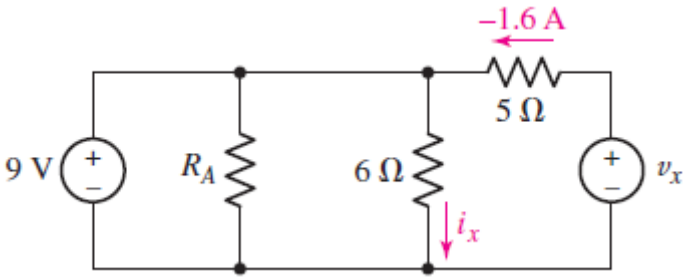


Fig. 2

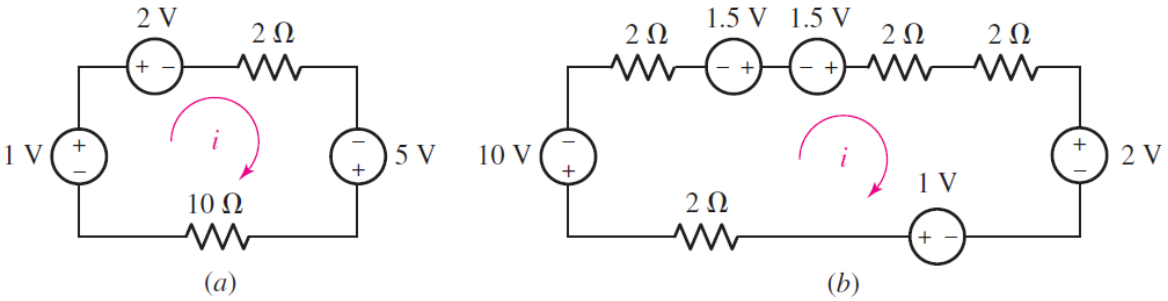
3. In the circuit shown, the resistor values are unknown, but the 2 V source is known to be supplying a current of 7 A to the rest of the circuit. Calculate the current labelled i_2.



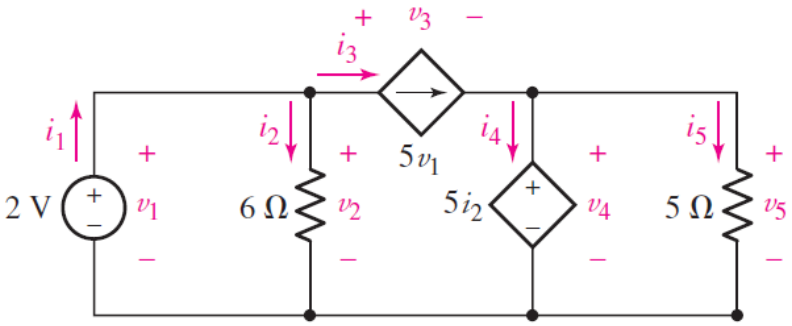
4. In the circuit depicted below, i_x is determined to be 1.5 A, and the 9 V source supplies a current of 7.6 A (that is, a current of 7.6 A leaves the positive reference terminal of the 9 V source). Determine the value of resistor R_A.



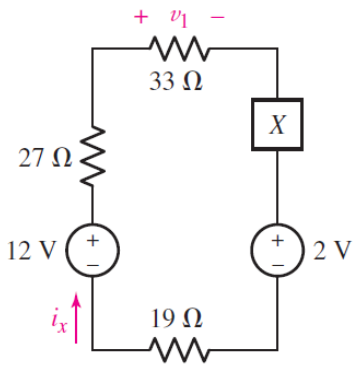
5. Use KVL to obtain a numerical value for the current labelled *i* in each circuit depicted



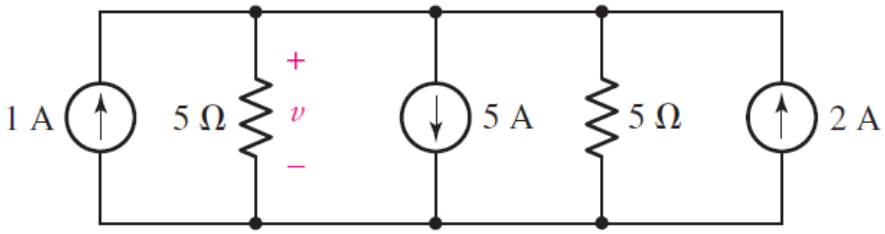
6. (*a*) Determine a numerical value for each current and voltage (i_1, v_1, etc.) in the below circuit. (*b*) Calculate the power absorbed by each element and verify that they sum to zero.



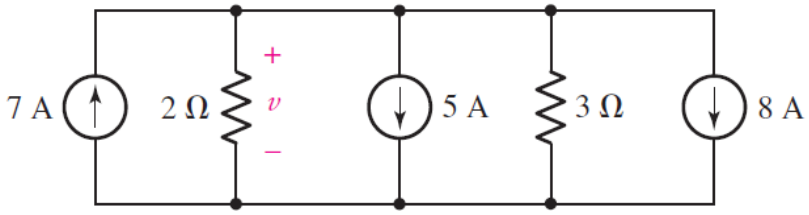
7. Compute the power absorbed by each element in the below circuit if the mysterious element *X* is
   (*a*) a 13 Ω resistor;
   (*b*) a dependent voltage source labelled $4v_1$, "+" reference on top;
   (*c*) a dependent voltage source labelled $4i_x$, "+" reference on top.



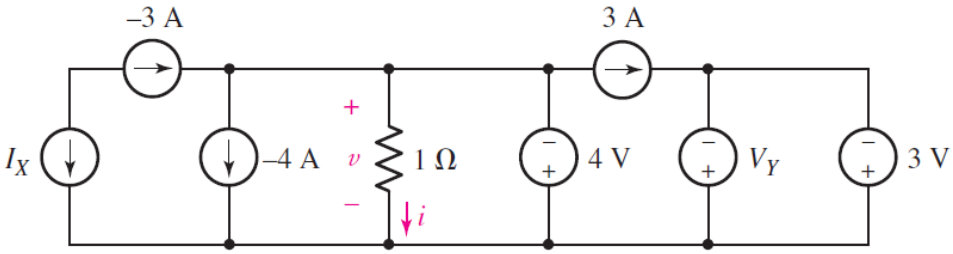
8. Referring to the circuit depicted below, determine the value of the voltage *v*.



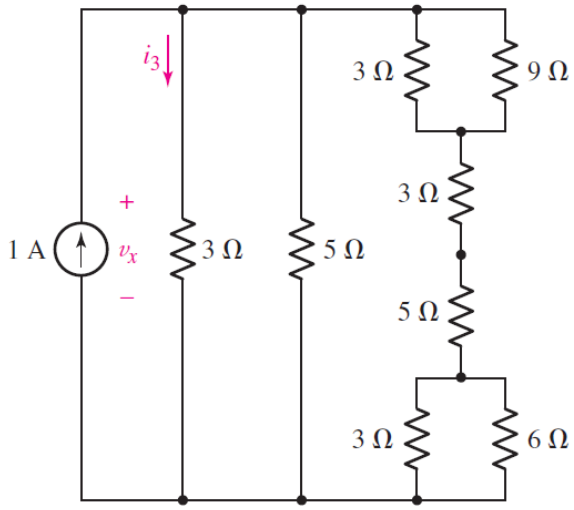
9. (*a*) For the below circuit, determine the value for the voltage labelled *v*, after first simplifying the circuit to a single current source in parallel with two resistors.
(*b*) Verify that the power supplied by your equivalent source is equal to the sum of the supplied powers of the individual sources in the original circuit.



10. (*a*) Determine the values for I_X *and* V_Y in the circuit shown below.
(*b*) Are those values necessarily unique for that circuit? Explain.
(*c*) Simplify the circuit as much as possible and still maintain the values for *v* and *i*. (Your circuit must contain the 1 Ω resistor.)

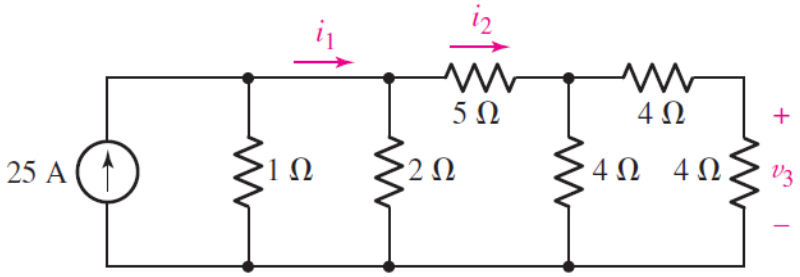


11. Making appropriate use of resistor combination techniques, calculate i_3 in the circuit below and the power provided to the circuit by the single current source.



12. A network is constructed from a series connection of five resistors having values 1 Ω, 3 Ω, 5 Ω, 7Ω, and 9 Ω. If 9 V is connected across the terminals of the network, employ voltage division to calculate the voltage across the 3 Ω resistor, and the voltage across the 7 Ω resistor.

13. Employing resistance combination and current division as appropriate, determine values for i_2, i_2, and v_3 in the circuit below.



14. The circuit depicted below is routinely employed to model the midfrequency operation of a bipolar junction transistor–based amplifier. Calculate the amplifier output v_{out} if the transconductance g_m is equal to 322 mS.