Problem Set #4

3.11  a) Find the voltage $v_x$ in the circuit in Fig. P3.11.
      b) Replace the 30 V source with a general voltage source equal to $V_s$. Assume $V_s$ is positive at the upper terminal. Find $v_x$ as a function of $V_s$.

![Figure P3.11]

3.16  In the voltage-divider circuit shown in Fig. P3.16, the no-load value of $v_o$ is 6 V. When the load resistance $R_L$ is attached across the terminals a and b, $v_o$ drops to 4 V. Find $R_L$.

![Figure P3.16]

3.18  The no-load voltage in the voltage-divider circuit shown in Fig. P3.18 is 150 V. The smallest load resistor that is ever connected to the divider is 60 kΩ. When the divider is loaded, $v_o$ is not to drop below 100 V.
      a) Design the divider circuit to meet the specifications just mentioned. Specify the numerical value of $R_1$ and $R_2$.

![Figure P3.18]
3.37 Design a d’Arsonval voltmeter that will have the three voltage ranges shown in Fig. P3.37.

a) Specify the values of $R_1$, $R_2$, and $R_3$.

![Figure P3.37](image)

4.3 Use the node-voltage method to find $v_1$ and the power delivered by the 60 V voltage source in the circuit in Fig. P4.3.

![Figure P4.3](image)

4.7 Use the node-voltage method to find $v_1$ and $v_2$ in the circuit shown in Fig. P4.7.

![Figure P4.7](image)

4.20 Use the node-voltage method to find $v_6$ in the circuit in Fig. P4.20.

![Figure P4.20](image)
4.30 a) Use the mesh-current method to find the branch currents $i_a$, $i_b$, and $i_c$ in the circuit in Fig. P4.30.

![Figure P4.30]

4.45 The circuit in Fig. P4.45 is a direct-current version of a typical three-wire distribution system. The resistors $R_a$, $R_b$, and $R_c$ represent the resistances of the three conductors that connect the three loads $R_1$, $R_2$, and $R_3$ to the 125/250 V voltage supply. The resistors $R_1$ and $R_2$ represent loads connected to the 125 V circuits, and $R_3$ represents a load connected to the 250 V circuit.

a) Calculate $v_1$, $v_2$, and $v_3$.

![Figure P4.45]