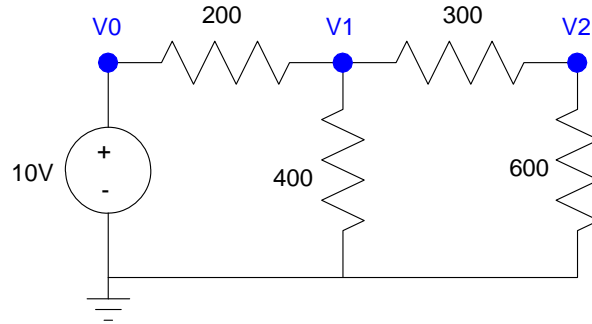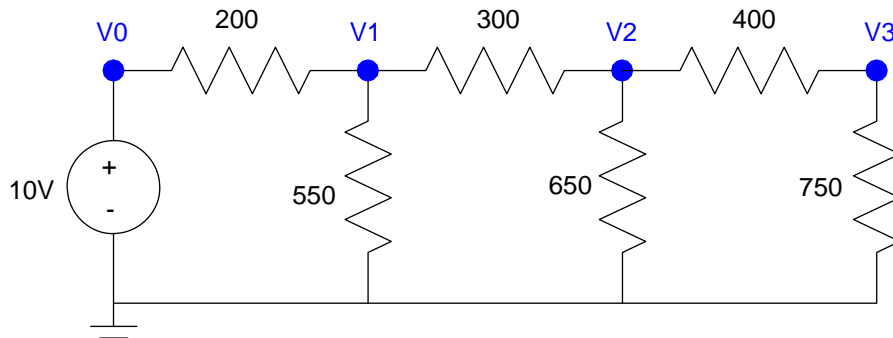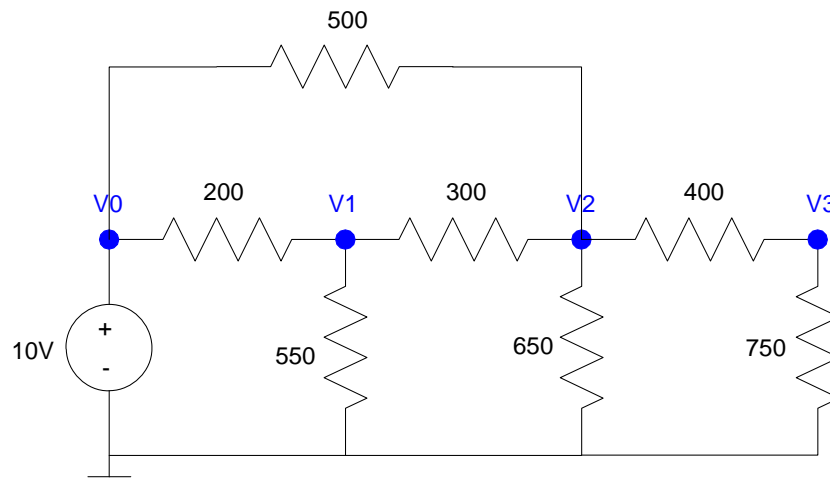# Voltage Nodes

EE 206 Practice Problems

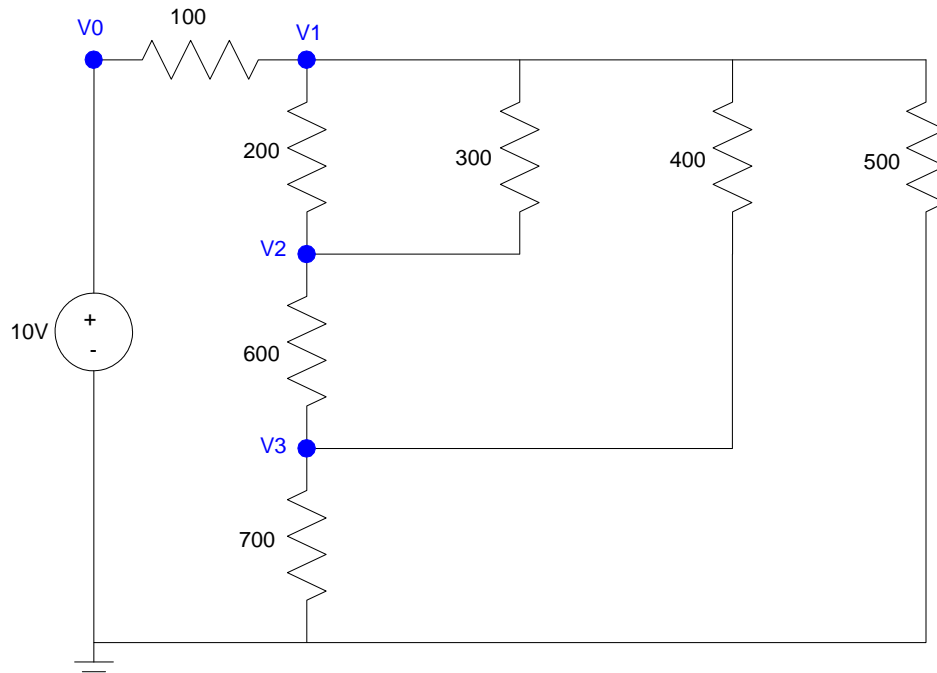Write the voltage node equations for the following circuits
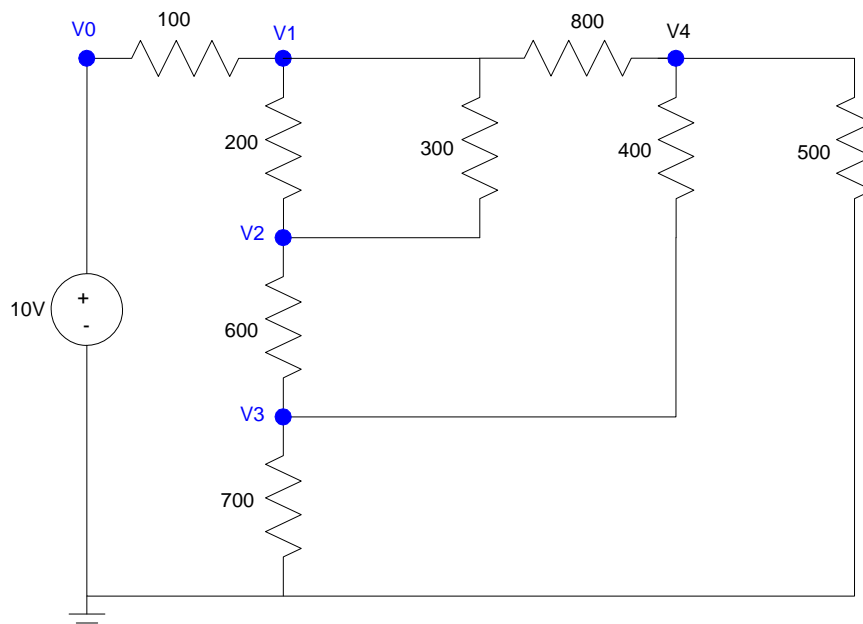
Problem 1

Problem 2

Problem 3

Problem 4

Problem 5

Solutions

Problem 1) There are 3 voltage nodes. You need 3 equations to solve for 3 unknowns

$$V_0 = 10$$

$$\left(\frac{V_1-V_0}{200}\right) + \left(\frac{V_1}{400}\right) + \left(\frac{V_1-V_2}{300}\right) = 0$$

$$\left(\frac{V_2-V_1}{300}\right) + \left(\frac{V_2}{600}\right) = 0$$

Problem 2) There are 4 voltage nodes. You need 4 equations to solve for 4 unknowns

$$V_0 = 10$$

$$\left(\frac{V_1-V_0}{200}\right) + \left(\frac{V_1}{550}\right) + \left(\frac{V_1-V_2}{300}\right) = 0$$

$$\left(\frac{V_2-V_1}{300}\right) + \left(\frac{V_2}{650}\right) + \left(\frac{V_2-V_3}{400}\right) = 0$$

$$\left(\frac{V_3-V_2}{400}\right) + \left(\frac{V_3}{750}\right) = 0$$

Problem 3) There are 4 voltage nodes. You need 4 equations to solve for 4 unknowns

$$V_0 = 10$$

$$\left(\frac{V_1-V_0}{200}\right) + \left(\frac{V_1}{550}\right) + \left(\frac{V_1-V_2}{300}\right) = 0$$

$$\left(\frac{V_2-V_1}{300}\right) + \left(\frac{V_2}{650}\right) + \left(\frac{V_2-V_3}{400}\right) + \left(\frac{V_2-V_0}{500}\right) = 0$$

$$\left(\frac{V_3-V_2}{400}\right) + \left(\frac{V_3}{750}\right) = 0$$

Problem 4) There are 4 voltage nodes. You need 4 equations to solve for 4 unknowns

$$V_0 = 10$$

$$\left(\frac{V_1-V_0}{100}\right) + \left(\frac{V_1-V_2}{200}\right) + \left(\frac{V_1-V_2}{300}\right) + \left(\frac{V_1-V_3}{400}\right) + \left(\frac{V_1}{500}\right) = 0$$

$$\left(\frac{V_2-V_1}{200}\right) + \left(\frac{V_2-V_1}{300}\right) + \left(\frac{V_2-V_3}{600}\right) = 0$$

$$\left(\frac{V_3-V_2}{600}\right) + \left(\frac{V_3-V_1}{400}\right) + \left(\frac{V_3}{700}\right) = 0$$

Problem 5) There are 5 voltage nodes. You need 5 equations to solve for 5 unknowns

$$V_0 = 10$$

$$\left(\frac{V_1-V_0}{100}\right) + \left(\frac{V_1-V_2}{200}\right) + \left(\frac{V_1-V_2}{300}\right) + \left(\frac{V_1-V_4}{800}\right) = 0$$

$$\left(\frac{V_2-V_1}{200}\right) + \left(\frac{V_2-V_1}{300}\right) + \left(\frac{V_2-V_3}{600}\right) = 0$$

$$\left(\frac{V_3-V_2}{600}\right) + \left(\frac{V_3-V_4}{400}\right) + \left(\frac{V_3}{700}\right) = 0$$

$$\left(\frac{V_4-V_1}{800}\right) + \left(\frac{V_4-V_3}{400}\right) + \left(\frac{V_4}{500}\right) = 0$$