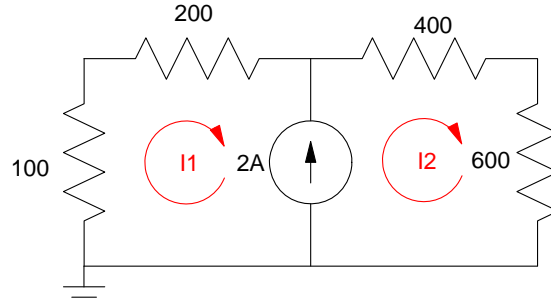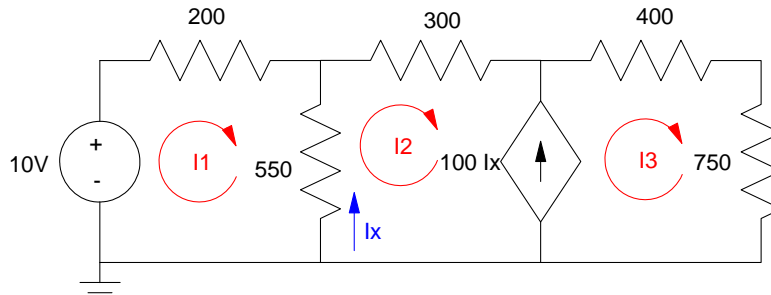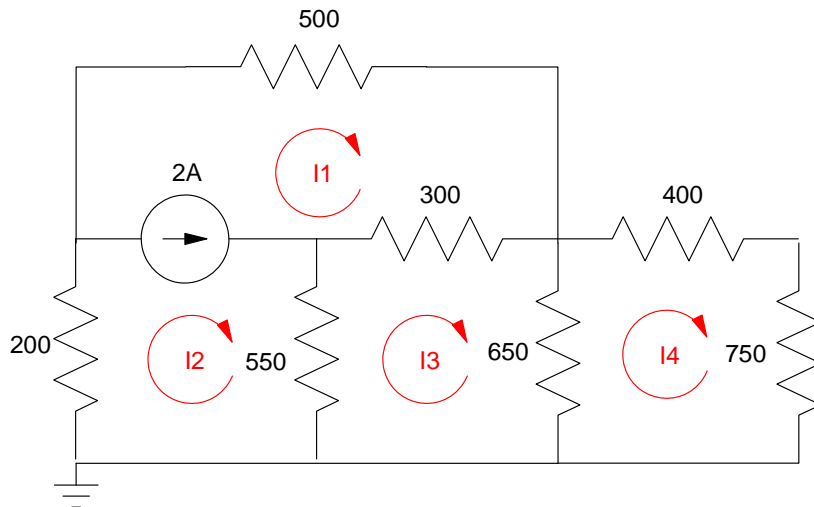# Super Loops

EE 206 Practice Problems
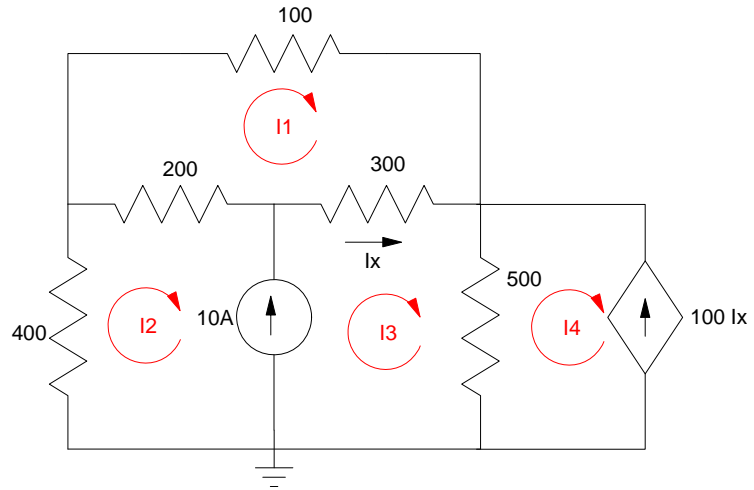
Write the current loop equations for the following circuits
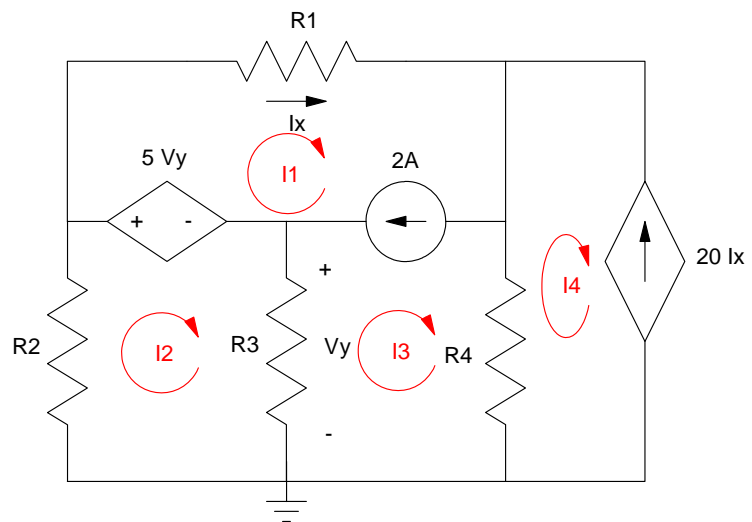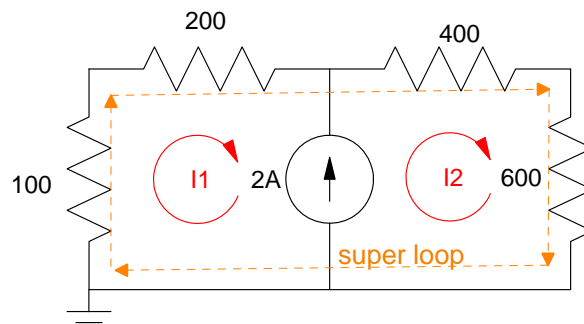
Problem 1

Problem 2

Problem 3

Problem 4

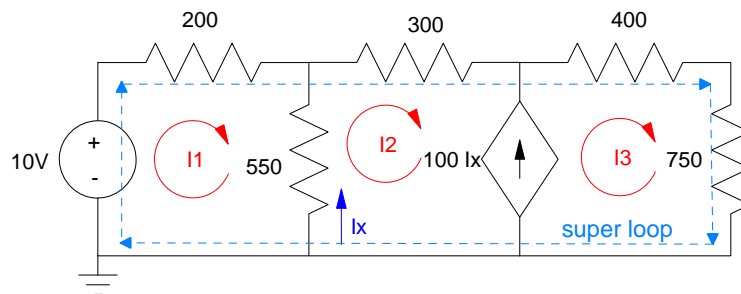Problem 5

Solutions

Problem 1) There are 2 current loops. You need 2 equations to solve for 2 unknowns

$$I_2 - I_1 = 2$$

$$100I_1 + 200I_1 + 400I_2 + 600I_2 = 0$$

Problem 2) There are 3 current loops plus a dependent source. You need 4 equations to solve for 4 unknowns

Start with the easy equations: the currents

$$I_x = I_2 - I_1$$

$$100I_x = I_3 - I_2$$

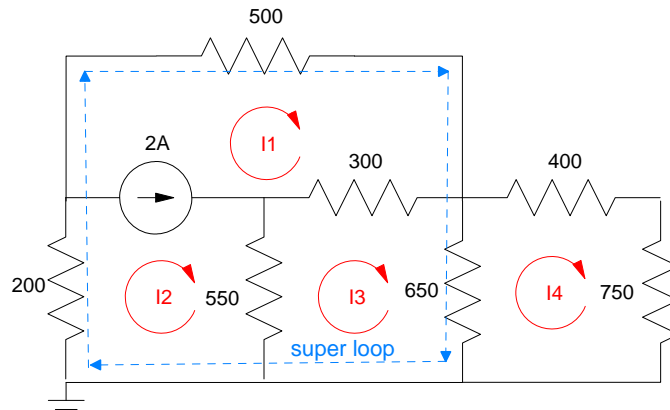Current Loop equations: the sum of the voltages around any closed path must be zero

Loop I1

$$-10 + 200I_1 + 550(I_1 - I_2) = 0$$

Super Loop (other super loops are valid)

$$-10 + 200I_1 + 300I_2 + 400I_3 + 750I_3 = 0$$

Problem 3) There are 4 current loops. You need 4 equations to solve for 4 unknowns
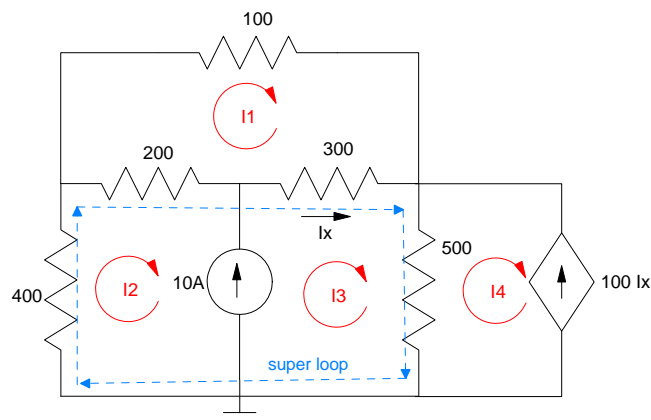

$$I_2 - I_1 = 2$$

$$550(I_3 - I_2) + 300(I_3 - I_1) + 650(I_3 - I_4) = 0$$

$$650(I_4 - I_3) + 400I_4 + 750I_4 = 0$$

$$200I_2 + 500I_1 + 650(I_3 - I_4) = 0 \qquad \textit{super loop}$$

Problem 4) There are 4 current loops plus a dependent source. You need 5 equations for 5 unknowns

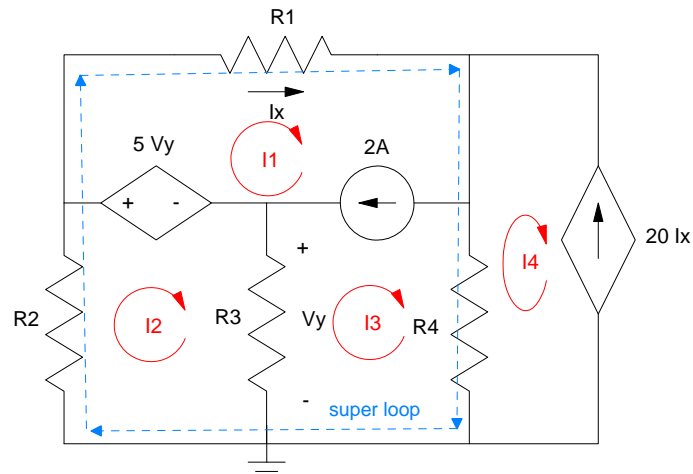$$I_x = I_3 - I_1$$

$$I_3 - I_2 = 2$$

$$I_4 = -100I_x$$

$$100I_1 + 300(I_1 - I_3) + 200(I_1 - I_2) = 0$$

Super-Loop: Other loops are valid

$$400I_2 + 200(I_2 - I_1) + 300(I_3 - I_1) + 500(I_3 - I_4) = 0$$

Problem 5) There are 4 loops and 2 dependent sources. You need 6 equations for 6 unknowns

$$I_x = I_1$$

$$V_y = R_3(I_2 - I_3)$$

$$I_1 - I_3 = 2$$

$$I_4 = -20I_x$$

$$R_2I_2 + 5V_y + R_3(I_2 - I_3) = 0$$

Super loop. Other super-loops are valid.

$$R_2I_2 + R_1I_1 + R_4(I_3 - I_4) = 0$$