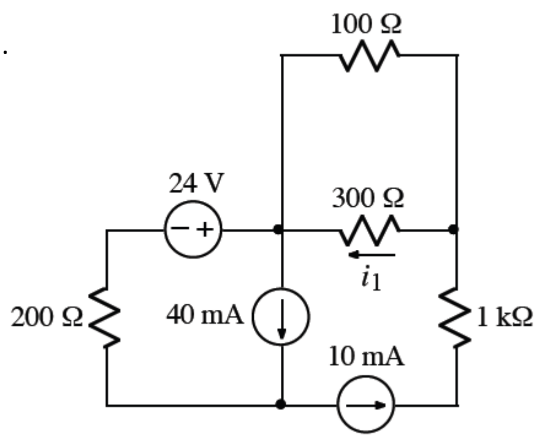
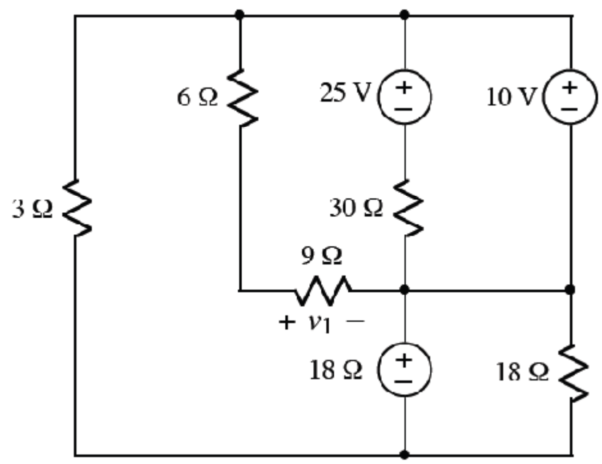
1.



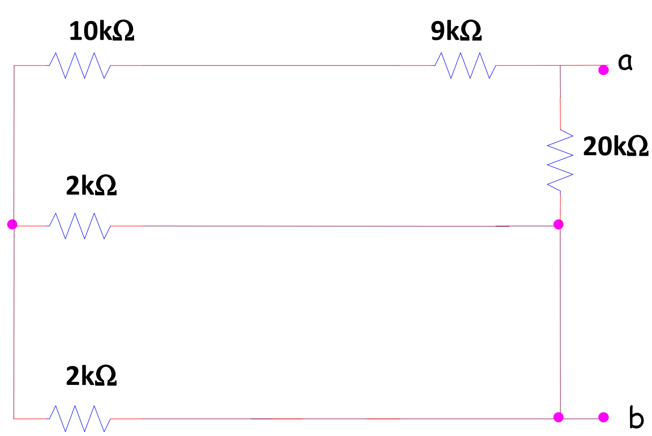
Calculate i_1.

2.

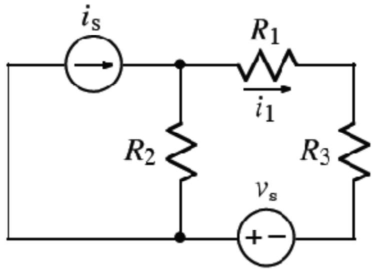


Calculate v_1.

3. Find the value of total resistance between terminals **a** and **b**.



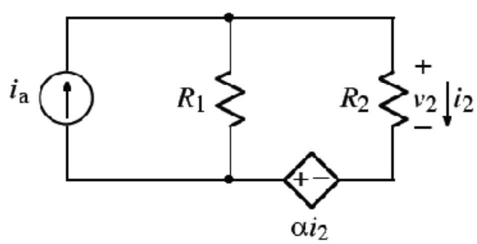
4.



Derive an expression for i_1. The expression must not contain more than the circuit parameters i_s, v_s, R_1, R_2, and R_3.

5. From Problem #4, make at least one consistency check (other than units check) on your expression. In other words, choose component values that make the circuit easy to solve just by looking at the new circuit. After solving this new circuit with the chosen component values, go back to the derived equations from Problem #4 and plug in those chosen component values and compare these equations to the newly solved circuit with those same component values.

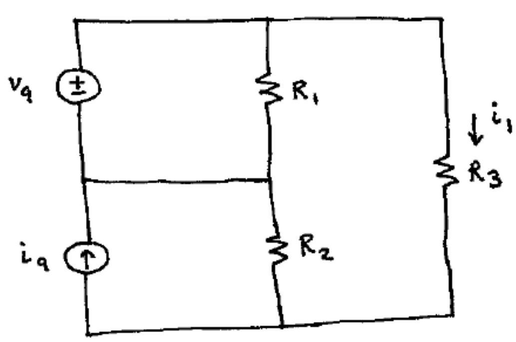
6.



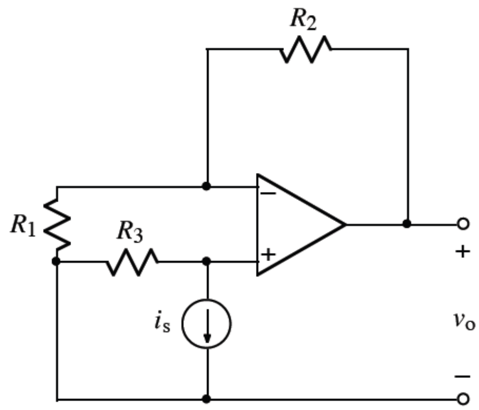
Derive an expression for v_2. The expression must not contain more than the circuit parameters α, i_a, R_1, and R_2. **Note:** $\alpha < 0$.

7. From Problem #6, make at least one consistency check (other than units check) on your expression. In other words, choose component values that make the circuit easy to solve just by looking at the new circuit. After solving this new circuit with the chosen component values, go back to the derived equations from Problem #6 and plug in those chosen component values and compare these equations to the newly solved circuit with those same component values.

8. Derive an expression for i_1. The expression must contain no other parameters than V_a, i_a, R_1, R_2, and/or R_3.

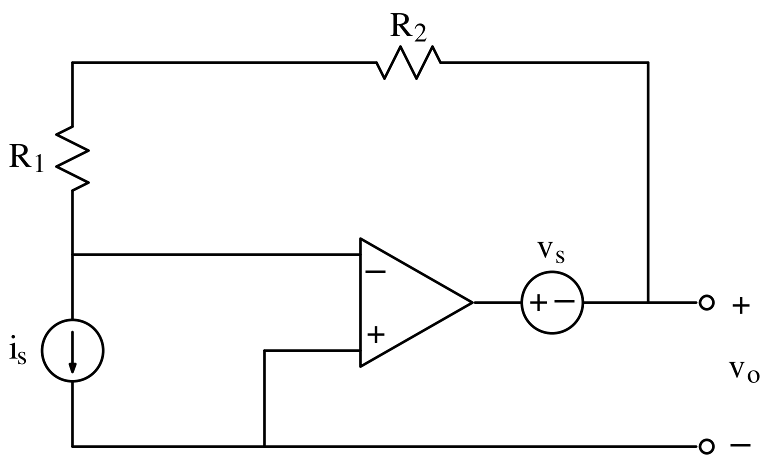


9.



The op-amp operates in the linear mode. Using an appropriate model of the op-amp, derive an expression for v_o in terms of not more than i_s, R_1, R_2, and R_3.

10.



The op-amp operates in the linear mode. Using an appropriate model of the op-amp, derive an expression for v_O in terms of not more than v_S, i_S, R_1, and R_2.