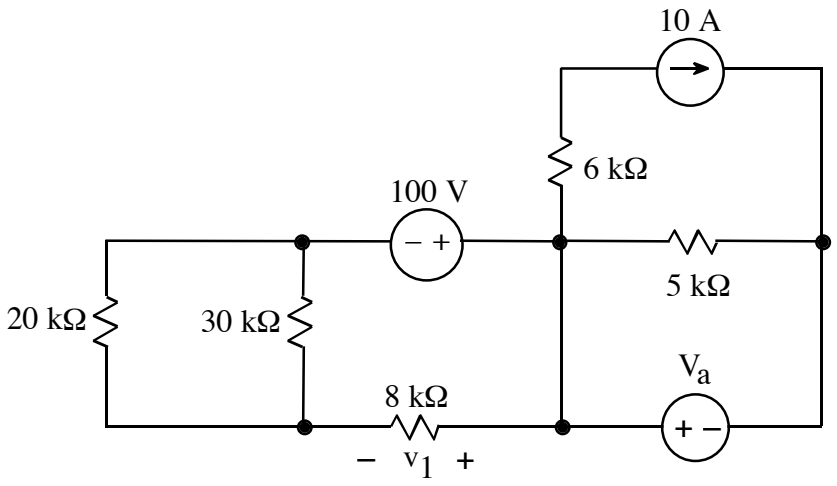
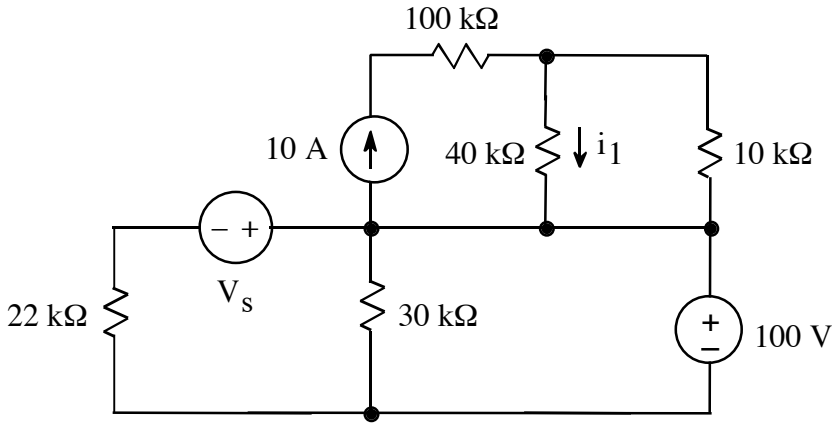
1. a. (5 points)

Calculate v_1.



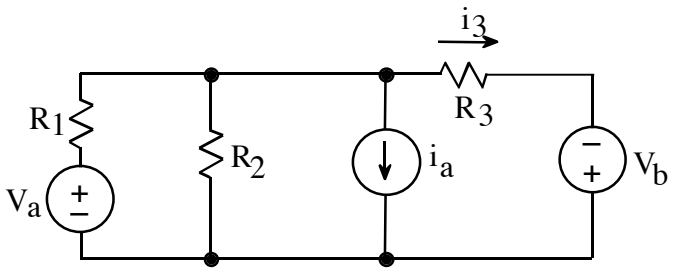
b. (5 points)

Calculate i_1.



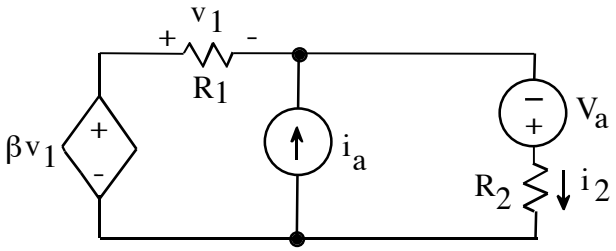
2. (30 points)

Derive an expression for i_3. The expression must not contain more than the circuit parameters V_a, V_b, i_a, R_1, R_2, and R_3.



3. (30 points)

a. Derive an expression for i_2. The expression must not contain more than the circuit parameters ß, V_a, i_a, R_1, and R_2.



b. Make at least one consistency check (other than a units check) on your expression. Explain the consistency check clearly.

4. (30 points)

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.