1. Calculate $v_1$.

2. Calculate $i_1$.

3. Derive an expression for $v_1$. The expression must not contain more than the circuit parameters $v_a$, $i_a$, $R_1$, $R_2$, and $R_3$. 
4. Derive an expression for \( v_1 \). The expression must not contain more than the circuit parameters \( \alpha, v_a, R_1, \) and \( R_2 \). Note: \( \alpha > 0 \).

b) Make at least one consistency check (other than a units check) on your expression. In other words, choose component values that make it possible to solve the circuit by inspection, and verify that your answer to (a) gives that answer. Specify your consistency check by listing a numerical value for every source and resistor.

5. 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 \( R_2 \).