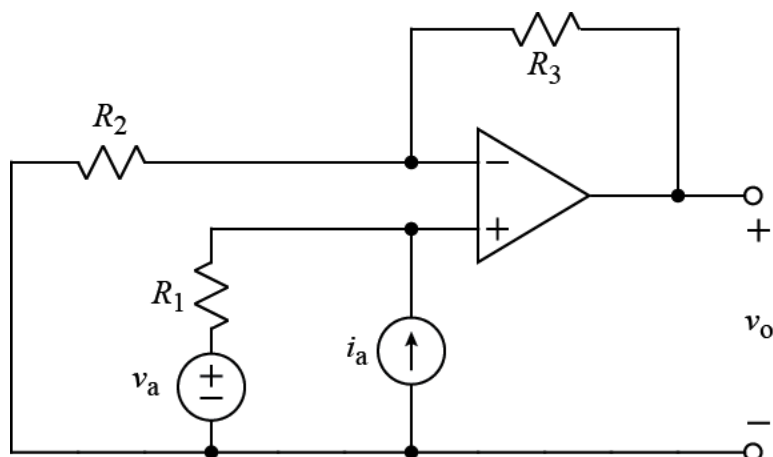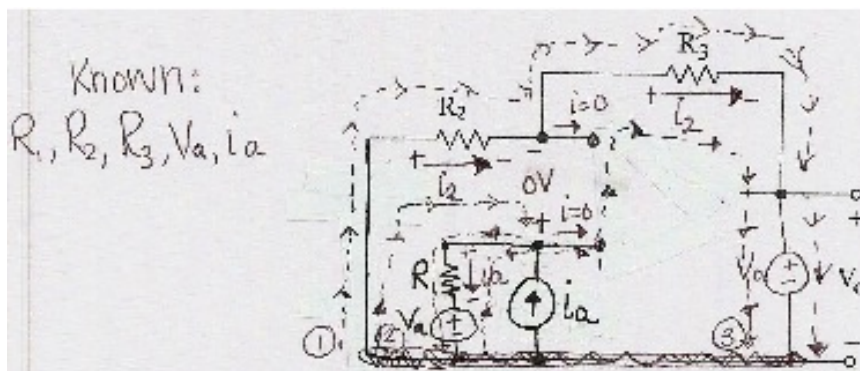**Ex:**

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_a, i_a, R_1, R_2, and R_3.

SOL'N:

Known:

R_1, R_2, R_3, V_a, i_a

V-loop:

① $-i_2 R_2 - i_2 R_3 - V_o = 0$

② $-i_2 R_2 - i_a R_1 - V_a = 0$

③ $+ V_a + i_a R_1 - i_2 R_3 - V_o = 0$

① $V_o = -i_2 (R_2 + R_3)$

② $i_2 = -\dfrac{(V_a + i_a R_1)}{R_2}$

plug ② into ①

$$V_o = \dfrac{(V_a + i_a R_1)(R_2 + R_3)}{R_2} = \left(1 + \dfrac{R_3}{R_2}\right)(V_a + i_a R_1)$$