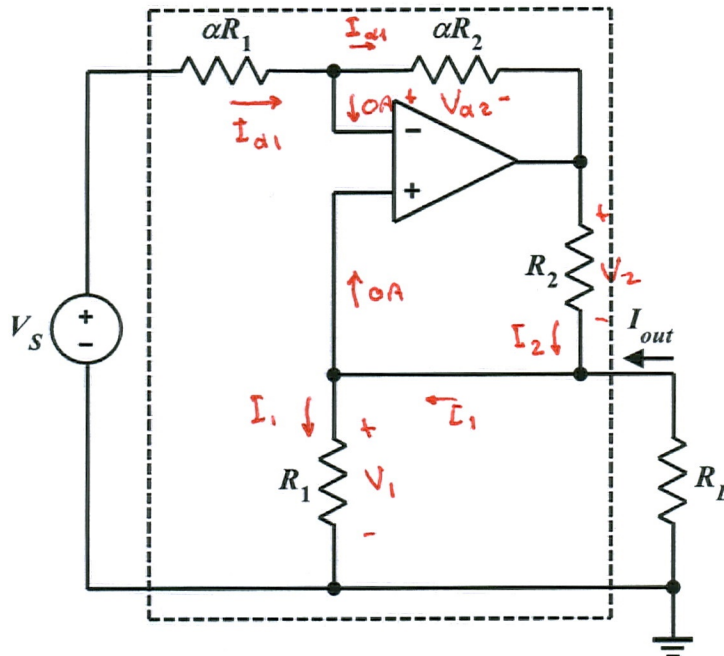


Homework Problem #04

The portion of the circuit enclosed by the dashed box converts a voltage source into a current source driving a grounded load. Show that regardless of the value of R_L , the output current is

$$I_{out} = V_S / R_1.$$



Define V_1 as shown.

$$\text{Then } I_1 = \frac{V_1}{R_1}$$

$$I_{d1} = \frac{V_S - V_1}{\alpha R_1}$$

$$V_{d2} = \alpha R_2 I_{d1} = \frac{R_2}{R_1} (V_S - V_1)$$

$$V_2 = -V_{d2} = \frac{R_2}{R_1} (V_1 - V_S)$$

$$I_2 = \frac{V_2}{R_2} = \frac{V_1 - V_S}{R_1}$$

$$I_{out} = I_1 - I_2 = \frac{V_1}{R_1} - \frac{V_1 - V_S}{R_1} = \frac{V_S}{R_1}$$