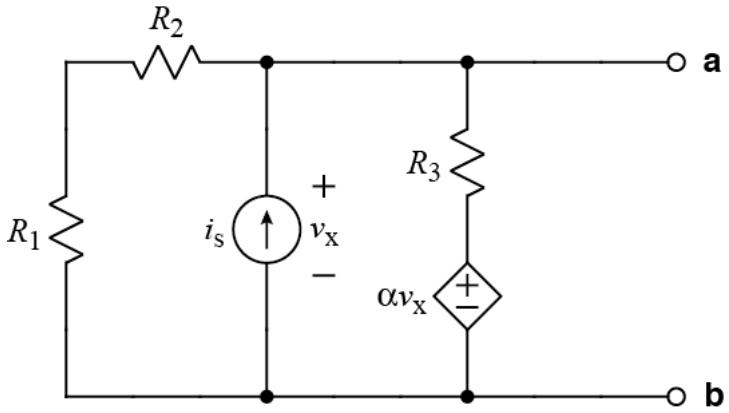
EX:



Find the Thevenin equivalent circuit at terminals a-b. v_x must not appear in your solution. The expression must not contain more than circuit parameters α, R_1, R_2, R_3, and i_s. **Note:** $0 < \alpha < 1$.

SOL'N:

① Find V_{th}: (Top node is V_{th})

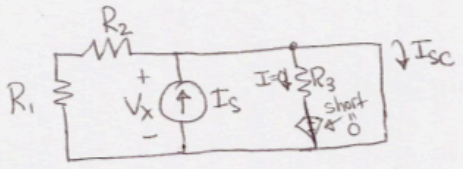
$$+\frac{V_{th}}{R_1+R_2} - I_S + \frac{V_{th}-\alpha V_x}{R_3}$$

$$V_x = V_{th}$$

$$\therefore V_{th}\left(\frac{1}{R_1+R_2} + \frac{1}{R_3} - \frac{\alpha}{R_3}\right) = I_S$$

$$\boxed{V_{th} = \frac{I_S(R_3)(R_1+R_2)}{R_3+(R_1+R_2)(1-\alpha)}}$$

② Find R_{th}: method using I_{sc}



$V_x = 0$

$I_{sc} = I_S$

$$\therefore R_{th} = \frac{V_{th}}{I_{sc}} = \boxed{\frac{R_3(R_1+R_2)}{R_3+(R_1+R_2)(1-\alpha)}}$$