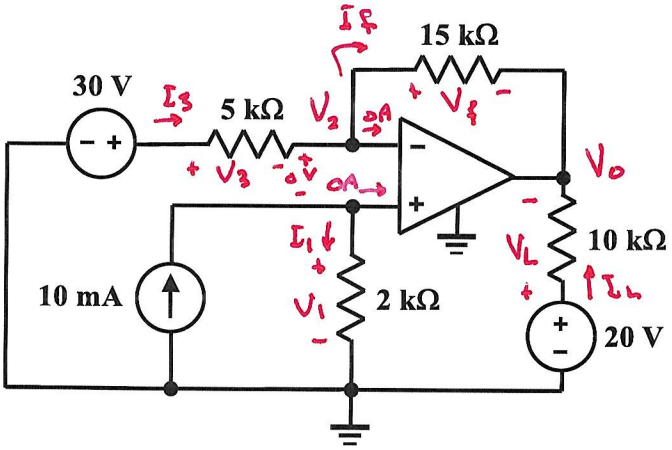
EE 2240

Homework Problem #042



The OpAmp is ideal.

(a) Determine the amount of power absorbed by the 10 kΩ resistor.

$I_1 = 10\text{mA} - 0 = 10\text{mA}$

$V_1 = (2\text{k}\Omega)\, I_1 = 20\text{ V}$

$V_2 = V_1 + 0 = 20\text{V}$

$V_3 = 30\text{V} - V_1 - 0 = 10\text{ V}$

$I_3 = \frac{V_3}{5\text{k}\Omega} = 2\text{ mA}$

$I_f = I_3 - 0 = 2\text{mA}$

$V_f = (15\text{k}\Omega)\, I_f = 30\text{V}$

$V_o = -V_f + 0 + V_1 = -10\text{V}$

$V_L = V_o - 20\text{V} = 30\text{V}$

$P = \frac{V_L^2}{10\text{k}\Omega} = 90\text{mW}$

(b) Is the 20 V source *delivering power* or *absorbing power*? How much?

$I_L = \frac{V_L}{10\text{k}\Omega} = 3\text{ mA}$

Since I_L flows out of the "+" end of the source, it is delivering

$(20\text{V})(I_L) = 60\text{ mW}$