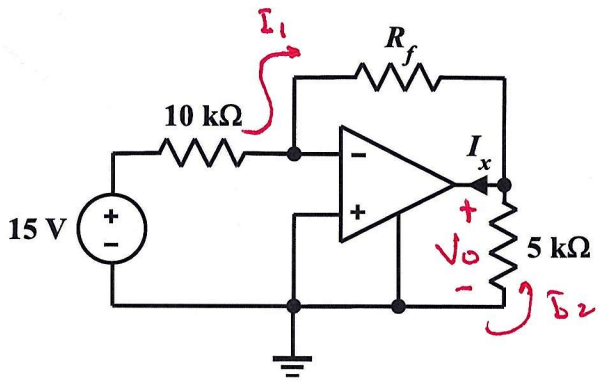
EE 2240

Homework Problem #054



The OpAmp is ideal. Determine the value of R_f that will yield $I_x = 2\text{mA}$.

$$I_1 = \frac{15\text{V}}{10\text{k}\Omega} = 1.5\text{ mA}$$

If $I_x = 2\text{mA}$, then

$$I_2 = I_x - I_1 = 2\text{mA} - 1.5\text{mA} = 0.5\text{mA}$$

But, $V_o = -\frac{R_f}{10\text{k}\Omega} \cdot 15\text{V} = -1.5\times10^{-3} R_f$

$$\Rightarrow I_2 = -\frac{V_o}{5\text{k}\Omega} = \frac{1.5\times10^{-3}}{5\text{k}\Omega} R_f = 0.3\times10^{-6} R_f$$

Then, $I_2 = 0.5\text{mA} = 0.3\times10^{-6} R_f$

$$\Rightarrow R_f = \frac{0.5\times10^{-3}}{0.3\times10^{-6}}$$

$$= \frac{5}{3}\text{k}\Omega$$

$$\approx 1667\ \Omega$$