Chapter 5, Solution 32.

Calculate i_x and v_o in the circuit of Fig. 5.70. Find the power dissipated by the 60-kΩ resistor.
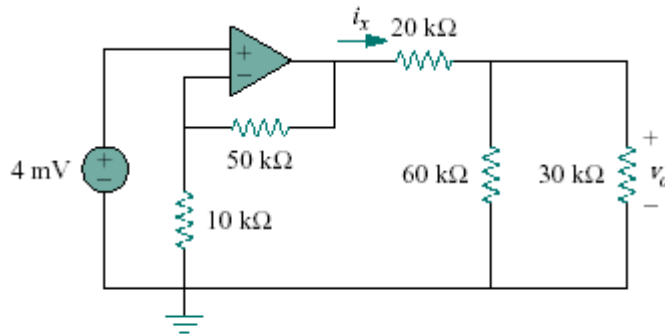

Figure 5.70
For Prob. 5.32.

Solution

Let v_x = the voltage at the output of the op amp. The given circuit is a non-inverting amplifier.

$$v_x = \left(1 + \frac{50}{10}\right)(4 \text{ mV}) = 24 \text{ mV}$$

$$60\|30 = 20\text{k}\Omega$$

By voltage division,

$$v_o = \frac{20}{20 + 20}v_x = \frac{v_x}{2} = 12\text{mV}$$

$$i_x = \frac{v_x}{(20 + 20)\text{k}} = \frac{24\text{mV}}{40\text{k}} = \textbf{600 nA}$$

$$p = \frac{v_o^2}{R} = \frac{144\text{x}10^{-6}}{60\text{x}10^3} = \textbf{204 nW}.$$