Chapter 5, Solution 33.

Refer to the op amp circuit in Fig. 5.71. Calculate i_x and the power absorbed by the 3-kΩ resistor.

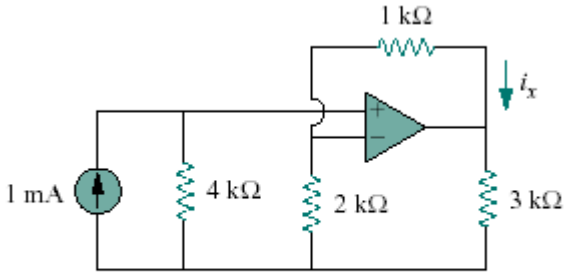
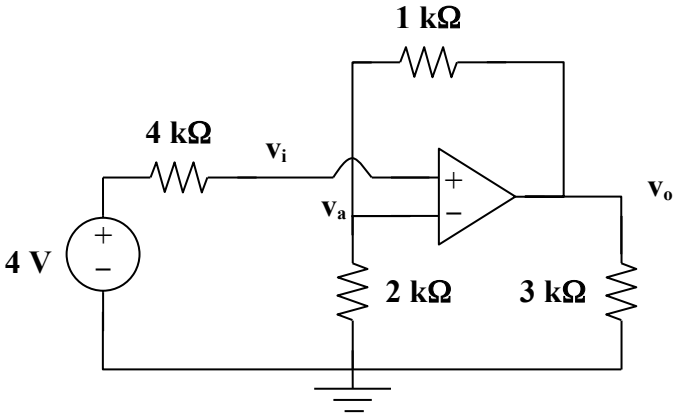


Figure 5.71
For Prob. 5.33.

Solution

After transforming the current source, the circuit is as shown below:



This is a noninverting amplifier.

$$v_o = \left(1 + \frac{1}{2}\right)v_i = \frac{3}{2}v_i$$

Since the current entering the op amp is 0, the source resistor has a 0 V potential drop. Hence $v_i = 4V$.

$$v_o = \frac{3}{2}(4) = 6V$$

Power dissipated by the 3kΩ resistor is

$$\frac{v_o^2}{R} = \frac{36}{3k} = \mathbf{12mW}$$

$$i_x = \frac{v_a - v_o}{R} = \frac{4 - 6}{1k} = \mathbf{-2mA}.$$

12 mW, –2 mA