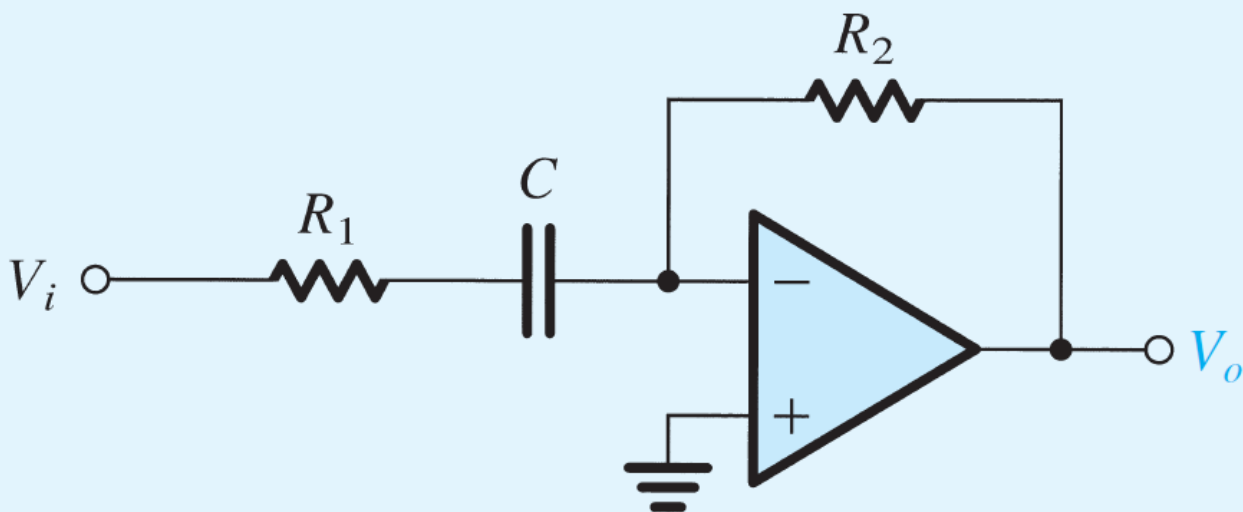


**2.23** Show that for the inverting amplifier if the op-amp gain is  $A$ , the input resistance is given by

$$R_{\text{in}} = R_1 + \frac{R_2}{A + 1}$$

**D 2.92** Figure P2.92 shows a circuit that performs the high-pass, single-time-constant function. Such a circuit is known as a first-order high-pass active filter. Derive the transfer function and show that the high-frequency gain is  $(-R_2/R_1)$  and the 3-dB frequency  $\omega_0 = 1/CR_1$ . Design the circuit to obtain a high-frequency input resistance of  $1 \text{ k}\Omega$ , a high-frequency gain of 40 dB, and a 3-dB frequency of 2 kHz. At what frequency does the magnitude of the transfer function reduce to unity?



**Figure P2.92**