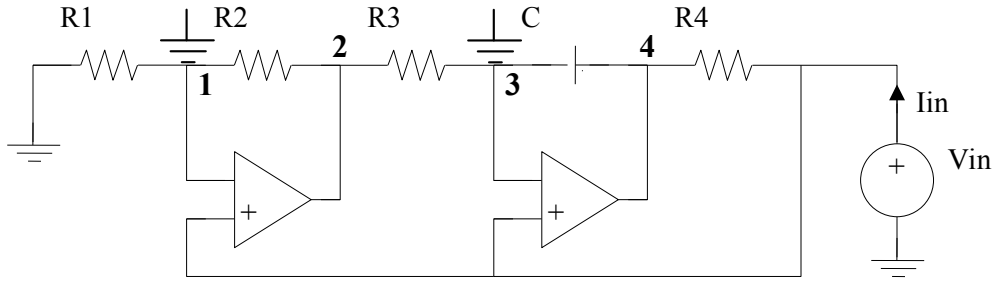
Chapter 10, Solution 89.

Consider the circuit below.



At node 1,

$$\frac{0-V_{in}}{R_1}=\frac{V_{in}-V_2}{R_2}$$

$$-V_{in}+V_2=\frac{R_2}{R_1}V_{in}$$

(1)

At node 3,

$$\frac{V_2-V_{in}}{R_3}=\frac{V_{in}-V_4}{1/j\omega C}$$

$$-V_{in}+V_4=\frac{V_{in}-V_2}{j\omega CR_3}$$

(2)

From (1) and (2),

$$-V_{in}+V_4=\frac{-R_2}{j\omega CR_3R_1}V_{in}$$

Thus,

$$I_{in}=\frac{V_{in}-V_4}{R_4}=\frac{R_2}{j\omega CR_3R_1R_4}V_{in}$$

$$Z_{in}=\frac{V_{in}}{I_{in}}=\frac{j\omega CR_1R_3R_4}{R_2}=j\omega L_{eq}$$

where $$L_{eq}=\frac{R_1R_3R_4C}{R_2}$$