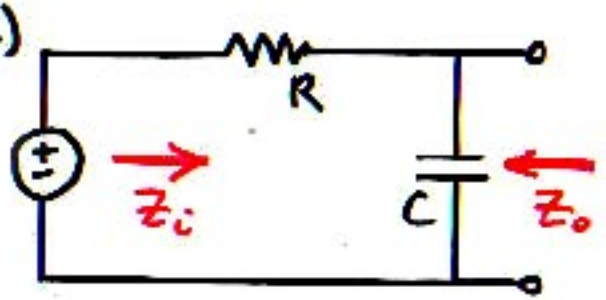
EXERCISE 3.2

SOLUTION

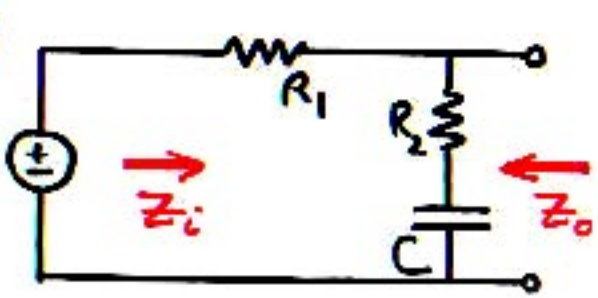
Exercise

Find the input and output impedances Z_i and Z_o in factored pole-zero form, and sketch the magnitude and phase asymptotes, for each of the two networks:

(a)



(b)



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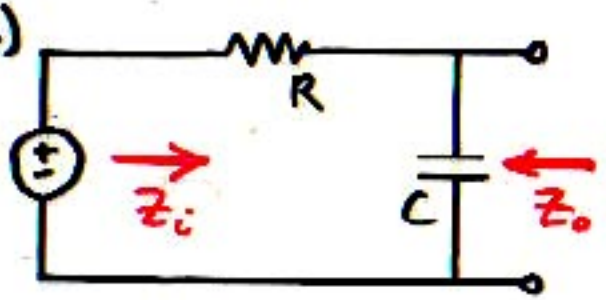
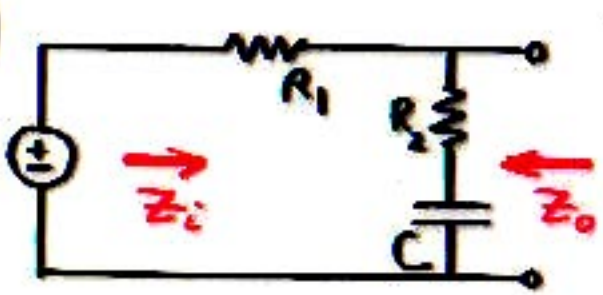


(b)

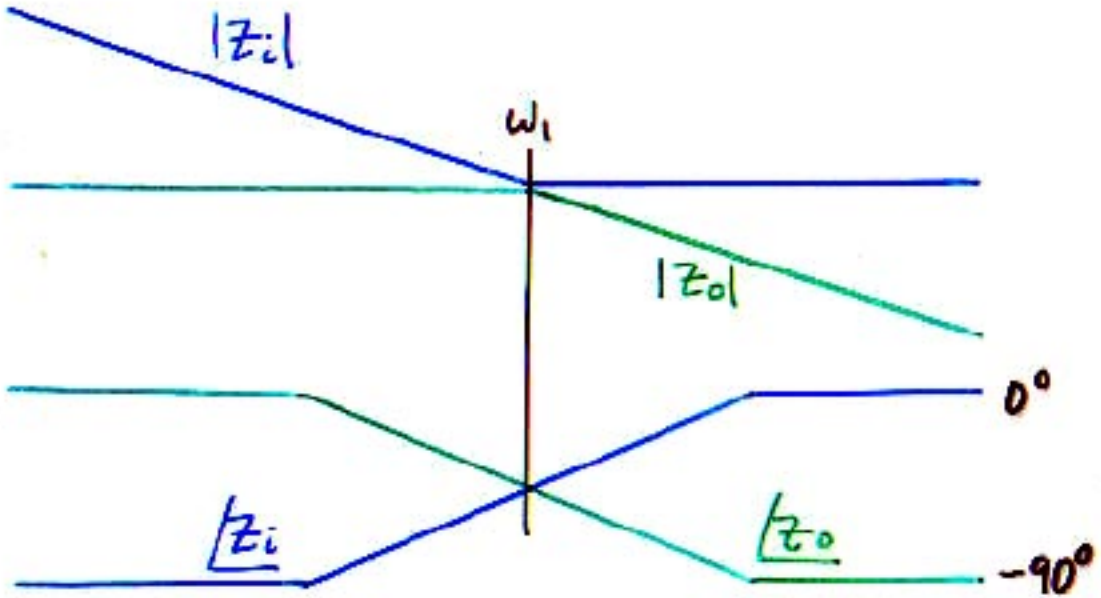


$$Z_i = R + \frac{1}{sC}$$

$$= R\left(1 + \frac{\omega_1}{s}\right) \quad \omega_1 = \frac{1}{CR}$$

$$Z_o = R \,||\, \frac{1}{sC}$$

$$= R \frac{1}{1 + \frac{s}{\omega_1}}$$



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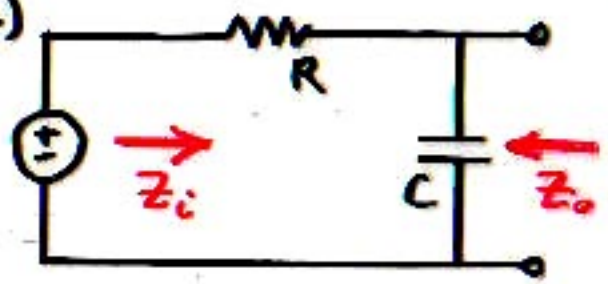
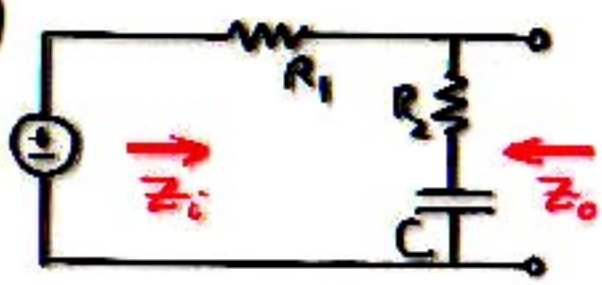


(b)



$$Z_i = R_1 + R_2 + \frac{1}{sC}$$

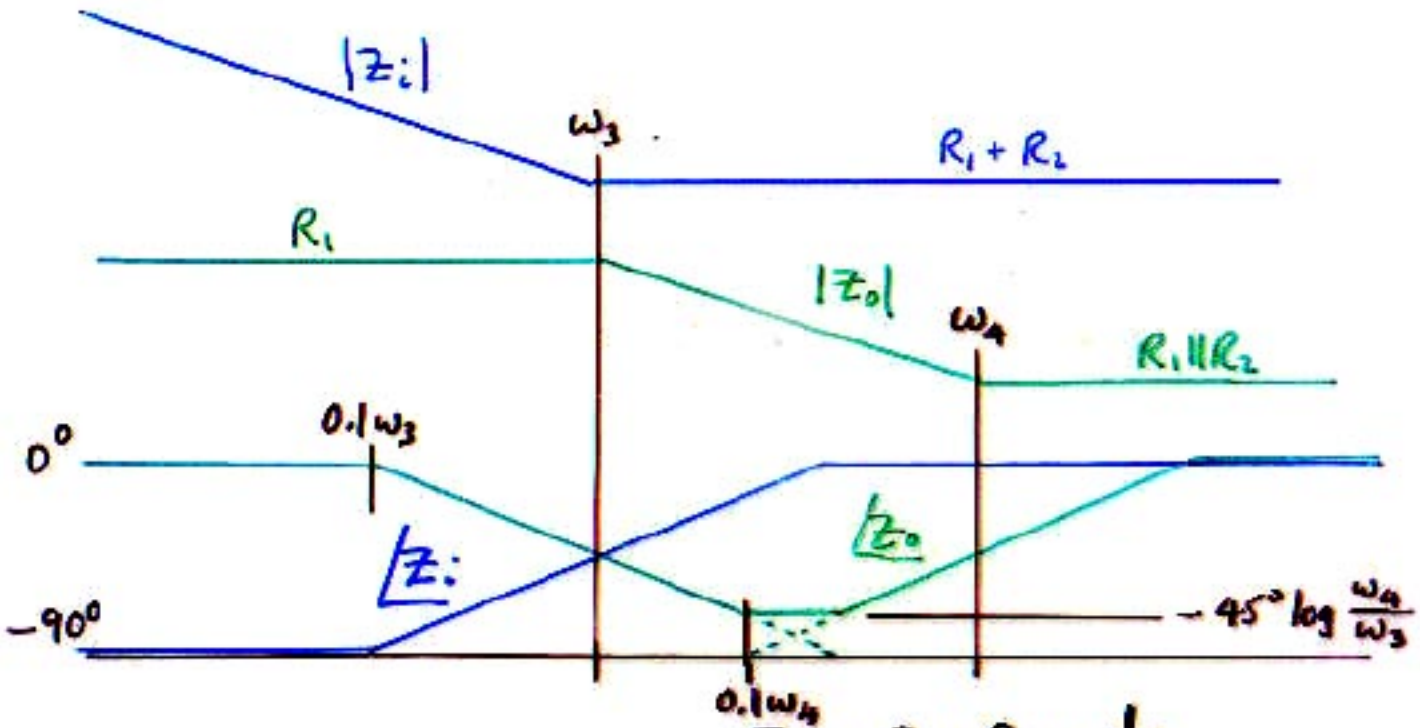
$$= (R_1 + R_2)\left(1 + \frac{\omega_3}{s}\right)$$

$$\omega_3 \equiv \frac{1}{C(R_1 + R_2)}$$

$$Z_o = R_1 \| (R_2 + \frac{1}{sC})$$

$$= (R_1 \| R_2)\,\frac{1 + \frac{\omega_4}{s}}{1 + \frac{\omega_3}{s}}$$

$$\omega_4 \equiv \frac{1}{CR_2}$$



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$$= (R_1 + R_2)\left(1 + \frac{\omega_3}{s}\right)$$

$$\omega_3 \equiv \frac{1}{C(R_1 + R_2)}$$

$$Z_0 = R_1 \| \left(R_2 + \frac{1}{sC}\right)$$

$$= (R_1 \| R_2)\,\frac{1 + \frac{\omega_4}{s}}{1 + \frac{\omega_3}{s}}$$

$$\omega_4 \equiv \frac{1}{CR_2}$$