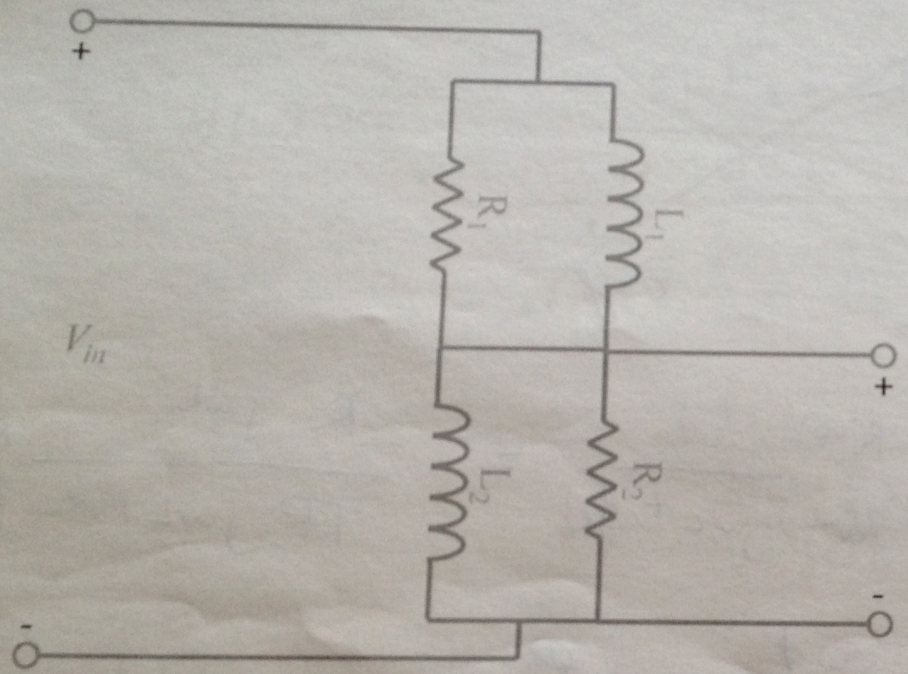
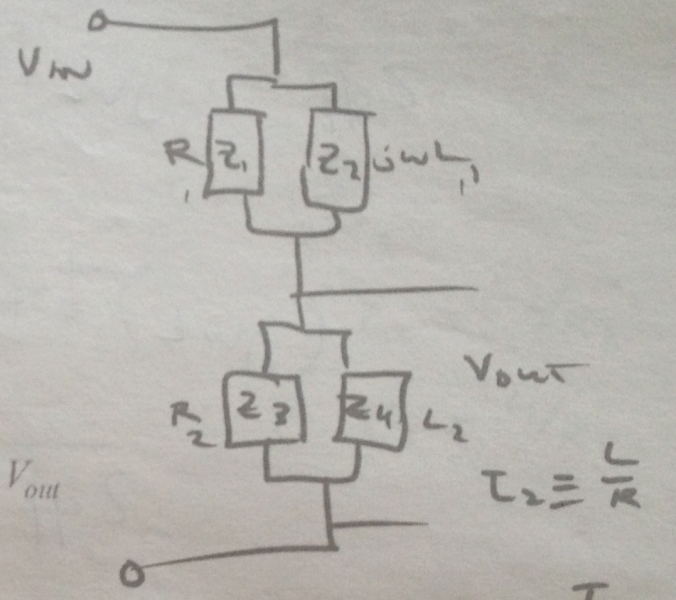
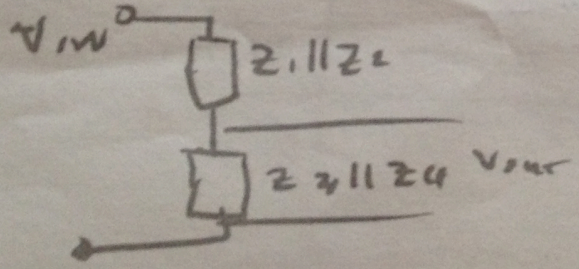
Text

Example Transfer function





Calculate H(ω) for this circuit. Sketch the magnitude of H(ω) vs. ω.



$$\frac{V_{out}}{V_{in}} = \frac{(Z_3 \| Z_4)}{(Z_3 \| Z_4) + (Z_1 \| Z_2)} \qquad \tau_2$$

$$= H(\omega) = \frac{\frac{j\omega L_2}{1 + j\omega\tau_2}}{Z_1 \| Z_3 + \frac{j\omega L_1}{1 + j\omega\tau_1}}$$

$$Z_{eff} = j\omega L \,\|\, R$$

$$(j\omega L)^{-1} + R^{-1} = Z_{eff}^{-1}$$

$$Z_{eff} = \frac{R(j\omega L)}{R(j\omega L)\frac{1}{j\omega L} + \frac{1}{R}} = \frac{R\, j\omega L}{TP\, j\omega L + R}\,\frac{\frac{1}{R}}{\frac{1}{R}}$$

$$= \frac{j\omega L}{j\omega \frac{L}{R} + 1} = \frac{j\omega L}{1 + j\omega \tau}$$

$R \| L$ $\quad \dfrac{j\omega L}{1 + j\omega\tau}$ $\quad \tau \equiv \dfrac{L}{R}$

$$H(\omega) = \frac{j\omega L_2}{1 + j\omega\tau_2} + \frac{j\omega L_1}{1 + j\omega\tau_1}$$

$\tau_1 = \dfrac{L_1}{R_1}$

$\tau_2 = \dfrac{L_2}{R_2}$

$\tau_2 = L_2/R_2$

$\tau_1 = L_1/R_1$

$$= \frac{1}{1 + \dfrac{1 + j\omega\tau_2}{1 + j\omega\tau_1}\dfrac{L_1}{L_2}}$$