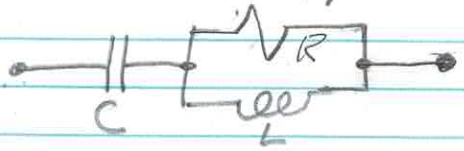
Homework #2 Physics 120 2019

① Write an expression for the complex impedance, $\hat{Z}(\omega)$, of

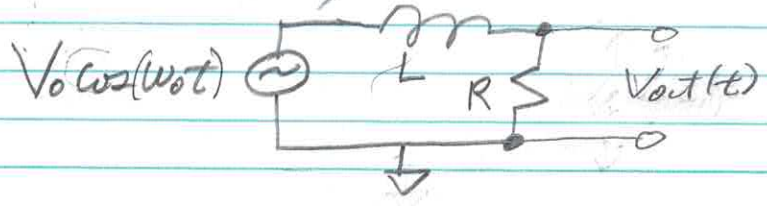
② Plot $|\hat{Z}(\omega)|$ vs ω on a log-log plot (Bode plot)
Identify the break frequencies.
Identify $|\hat{Z}(\omega)|$ as $\omega \to 0$.
Identify $|\hat{Z}(\omega)|$ as $\omega \to \infty$.

③ Write an expression for the complex impedance of:



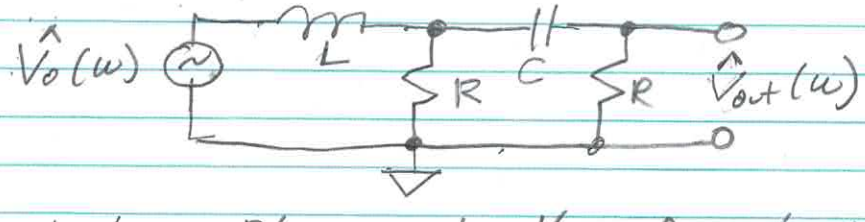
Plot $\log|\hat{Z}(\omega)|$ vs $\log\omega$ (Bode plot).
Plot $\text{atan}[\hat{Z}(\omega)] \equiv \text{atan}[\text{Im}(\hat{Z}(\omega))/\text{Re}(\hat{Z}(\omega))]$ vs $\log\omega$; this is a plot of the phase shift.

④ Find the steady state value of $V_{out}(t)$ in:



Use either the convolution or the Fourier transform method - your choice! Let $\tau \equiv L/R$ for algebraic simplicity.

⑤ Find the steady state value of $\hat{V}_{out}(\omega)$ in:



Let $a \equiv R/L$ and $b \equiv 1/RC$ for algebraic simplicity.

⑥ Plot $\log|\hat{V}_{out}(\omega)|/|\hat{V}_0(\omega)|$ vs $\log\omega$ for the case of $a=b$.