

## Physics 4L HW 5 (2026)

Use the rule of voltage division to write  $V_{out}(\omega)/V_{in}(\omega)$  for all of the pair-wise R-C-L circuit combinations, as shown below. Express your answer in polar coordinate form, i.e.,

$V_{out}(\omega)/V_{in}(\omega) = \text{Magnitude}(\omega) e^{i\phi(\omega)}$ , where

$$\text{Magnitude} = \sqrt{(\text{Im}(V_{out}(\omega)/V_{in}(\omega)))^2 + (\text{Re}(V_{out}(\omega)/V_{in}(\omega)))^2}$$

$$\phi(\omega) = \text{atan}[\text{Im}(V_{out}(\omega)/V_{in}(\omega))/\text{Re}(V_{out}(\omega)/V_{in}(\omega))].$$

Make a Bode plot, with reasonable ranges in terms of a logarithmic scale.

Identify the asymptotic frequency dependence. For purposes of graphing, let  $L = 1 \text{ H}$ ;  $C = 1 \text{ F}$ ;  $R = 1 \Omega$ .

