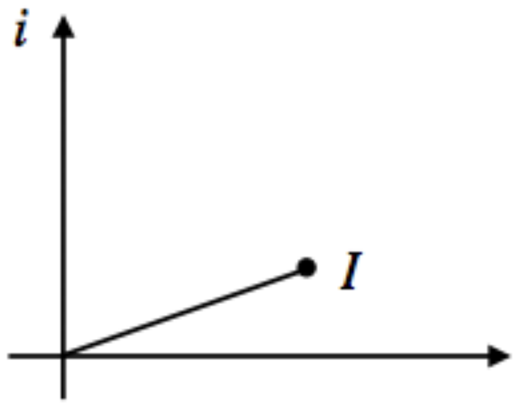
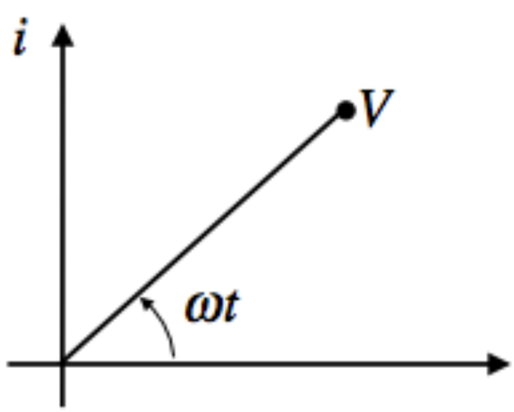
Complex Impedence

A. Given $Z = 2\exp(i\pi/4)$ and the complex number I shown in the diagram below, plot the complex number $V = I \cdot Z$



Given $V = V_0 \exp(i\omega t)$ and $Z = 2\exp(-i\pi/2)$, plot the complex number $I = V/Z$ at the instant in time shown in the diagram below.

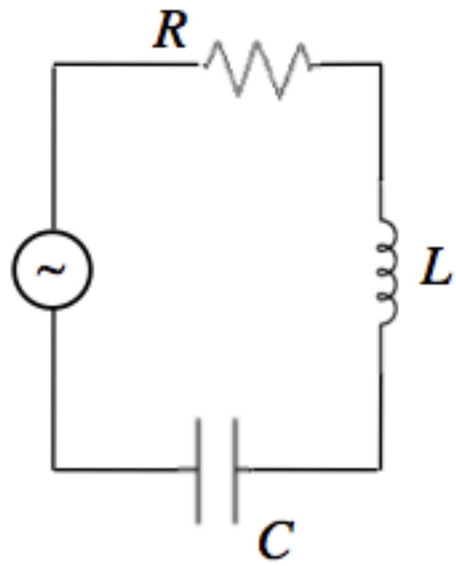


B. For the same situation as before, with $V = V_0 \exp(i\omega t)$ and $Z = 2\exp(-i\pi/2)$, sketch the real (physical) values of V & I as functions of time in the graphs below.

Does the current *lead* or *lag* the voltage? Make sure your answers on this page are consistent with the phasor diagram you drew on the previous page for the same situation.

▽ You may continue, but be sure to check your answers to this part with an instructor.

C. The complex impedances for the following circuit elements are:

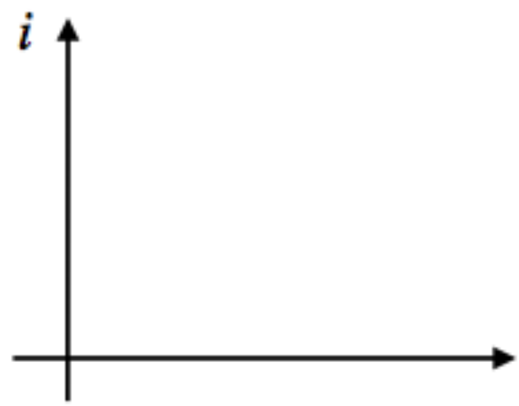


$$Z_R = R \qquad Z_L = i\omega L \qquad Z_C = \frac{1}{i\omega C}$$

What is Z_{TOTAL} for this circuit?

Write Z_{TOTAL} in the form $a + ib$.

D. For graphing purposes, assume that $\omega L > 1/\omega C$. Sketch Z_R, Z_C, Z_L, and show how they add as vectors to get Z_{TOTAL}.



Under what circumstances does the current *lead* the voltage?

Under what circumstances are the current and voltage *in phase*?