Discussion 3B

1. Adding Sinusoids with Phasors (Hambley Example 5.3)

Suppose you are given two sinusoidal inputs:

$$v_1(t) = 20\cos(\omega t - 45^\circ) \tag{1}$$

$$v_2(t) = 10\sin(\omega t + 60^\circ) \tag{2}$$

Add together the inputs $v_s(t) = v_1(t) + v_2(t)$ such that $v_s(t)$ is composed of a single cosine term.

2. Inductor Impedance (Hambley Exercise 5.6)

(a) A sample inductor circuit is given in Figure 1.

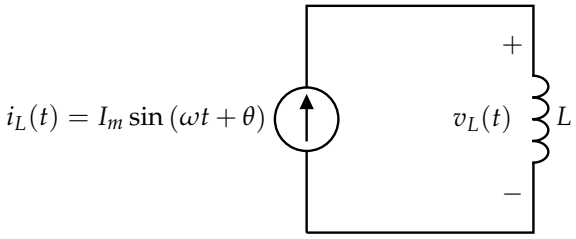


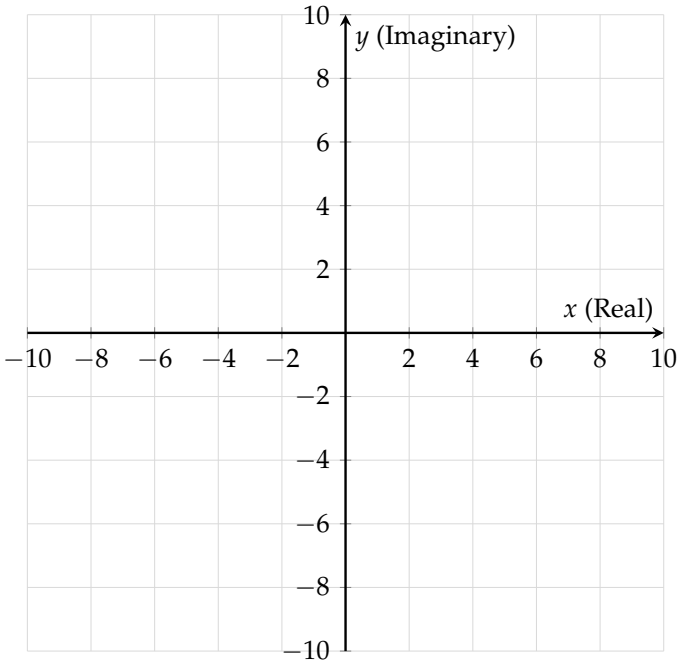
Figure 1: Sample inductor circuit

Derive the impedance of the inductor Z_L given that $\mathbf{V_L} = Z_L \mathbf{I_L}$.

(b) Assume that now you are told that a voltage of $v_L(t) = 10\cos(20t)$ is applied to a 0.25-H inductance.

Calculate the impedance of the inductor, the phasor current, and the phasor voltage.

(c) **Sketch the phasors $\mathbf{V_L}$ and $\mathbf{I_L}$ on the complex plane and state the phase relationship of the current and voltage of a pure inductance.**



3. Series and Parallel Combinations of Complex Impedances

Consider the circuit shown in Figure 2.

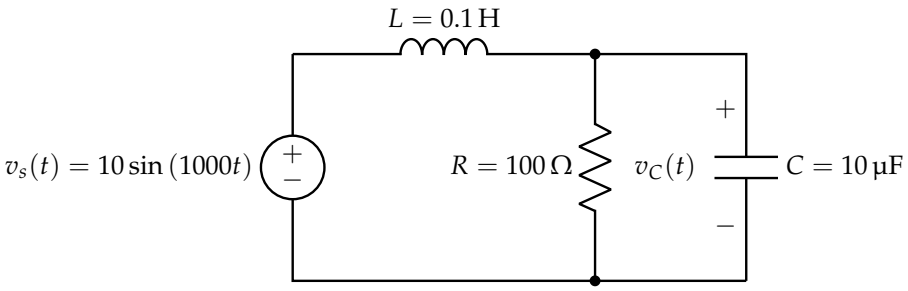


Figure 2: RLC Circuit

(a) **Find the voltage $v_C(t)$ in steady state.**

(b) **Find the phasor current through each element.**

(c) **Sketch a phasor diagram showing the currents and the source voltage.**