HW 2 Due Friday September 4 in class

1. Choose the values of $R$, $L$, and $C$ that achieve certain impedances.
   
   (a) At what frequency will a $C = 0.033 \mu F$ capacitor’s impedance equal $-j100\Omega$?
   
   (b) At what frequency will a $L = 47\, mH$ inductor’s impedance equal $j100\Omega$?
   
   (c) At what frequency will a $R = 100\, \Omega$ resistor’s impedance equal $100\Omega$?

2. Find the equivalent impedance $Z$. If $\omega = 10\, \text{krad/sec}$ what two elements could be used to replace the phasor circuit?

3. The circuit is excited by a $\omega = 1\, \text{krad/s}$ sinusoidal source. Select a capacitor $C$ so that the impedance $Z$ looking into the circuit is real with no imaginary part.
A voltage \( v_s(t) = 3 \cos(2000t) \) [V] is applied to the circuit

(a) Convert the circuit into the phasor domain.

(b) Find the phasor current \( i(t) \) flowing through the circuit and the phasor voltage across the inductor \( v_L(t) \) and across the reistor \( v_R(t) \).

(c) Plot all three phasors from the previous part on a phasor diagram. Does the current \( i(t) \) lead or lag the inductor voltage.

For the following phasor impedance circuit:

(a) Find \( Z(j\omega) \). Do not “simplify”.

(b) Find expressions for magnitude and phase

(c) Find \( Z(j\omega) \) for low frequency \((\omega \to 0)\) and high frequency \((\omega \to \infty)\). For this do not use the equations. Instead use functional reasoning