Group Discussion
1. True or False: In an RLC circuit, voltage across the capacitor lags the current through it by 90 degrees.

Work Problems
2. The phasor diagram for a series RLC circuit is shown in the figure with only the phasor $V_R$ is labeled corresponding to the resistor. Which of the other included 5 phasors (A, B, and C, D and E) corresponds to that of the generator?

(a) A
(b) B
(c) C
(d) D
(e) E

4. A 150 ohm resistor is connected in series with a 0.25 H inductor. The voltage across the resistor is $v_R = 3.8\cos(720t)$

(a) Derive the expression (sinusoidal wave) for the current through the circuit.
(b) Find the reactance of the inductor $X_L$
(c) Derive the expression (sinusoidal wave) for the voltage across the inductor.
5. A $R = 500 \Omega$ resistor and a capacitor are connected in series across an AC supply of 50 Hz. The voltage across the resistor is 120 V and the voltage across the capacitor is 160 V. What is the capacitance of the capacitor?

\[ V = I \times R \quad I = \frac{120}{500} = 0.24 A \]

\[ V = I \times X \quad 160 = 0.24 \times X_c \quad X_c = 667 \text{ ohms} \]

\[ X_c = \frac{1}{\omega C} \quad C = \frac{1}{\omega X_c} = 1.7 \times 10^{-5} \text{ F} \]

6. In the figure, the inner loop carries a clockwise current $I$ that is increasing. The resistor $R$ is in the outer loop and both loops are in the same plane. The induced current through the resistor $R$ is

- Magnetic field in this region is negligible
- Flux through large loop is increasing into page so it will create a $B$ field out of the page to oppose it
- Current will be CCW

A) from $a$ to $b$.
B) from $b$ to $a$.
C) There is no induced current through the resistor.