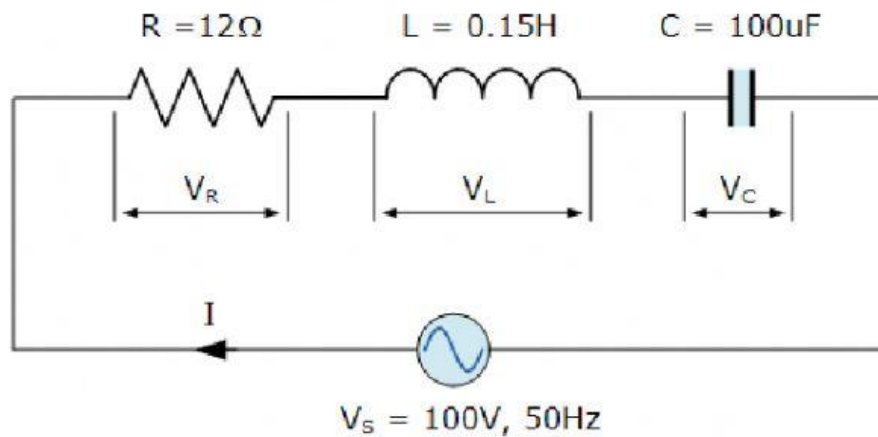


Using Complex numbers to solve RLC Circuits – M2 Worksheet



Step 1: Calculate angular velocity of this circuit:

$$\omega = 2\pi f =$$

Step 2: Calculate individual impedances for each component:

$$X_L = (\omega \times L) j =$$

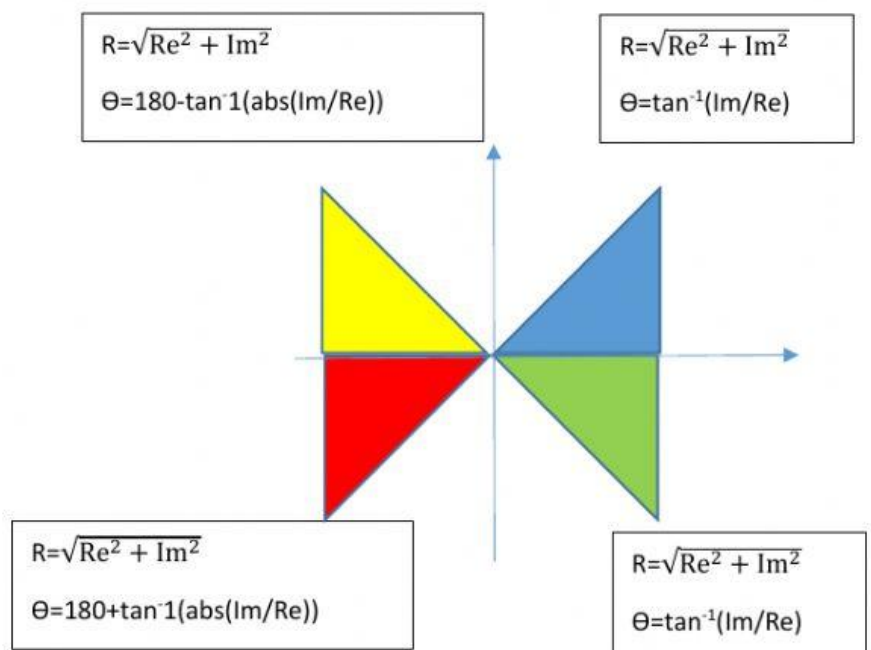
$$X_C = \frac{-j}{\omega C} =$$

Step 3: Calculate total impedance:

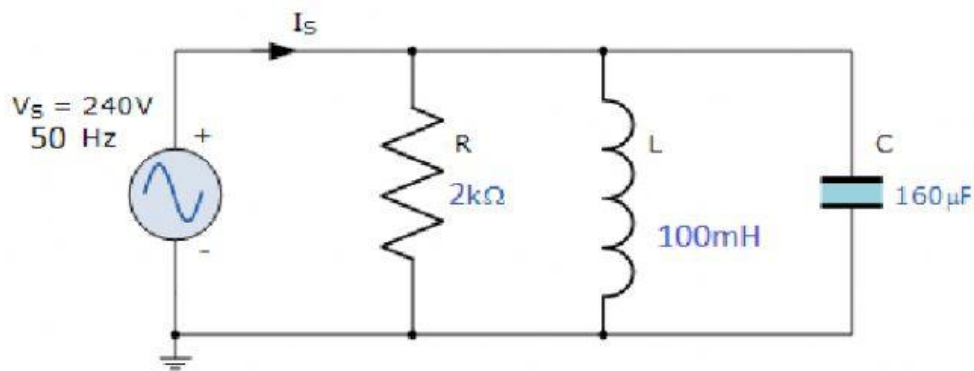
$$Z = R + (X_L + X_C) =$$

Step 4: Now find out in which quadrant of the state space z is located and then convert Z to the polar form:

$$Z = r \angle \theta =$$



Using Complex numbers to solve RLC Circuits – M2 Worksheet



Step 1: Calculate angular velocity of this circuit:

$$\omega = 2\pi f =$$

Step 2: Calculate individual impedances for each component:

$$X_L = (\omega \times L) j =$$

$$X_C = \frac{-j}{\omega C} =$$

Step 3: Calculate total impedance:

$$\frac{1}{Z} = \frac{1}{R} + \frac{1}{X_C} + \frac{1}{X_L} =$$

Step 4: bring up j in X_C and X_L to the nominator and simplify them:

$$\frac{1}{Z} = \frac{1}{R} + \frac{1}{X_C} + \frac{1}{X_L} =$$

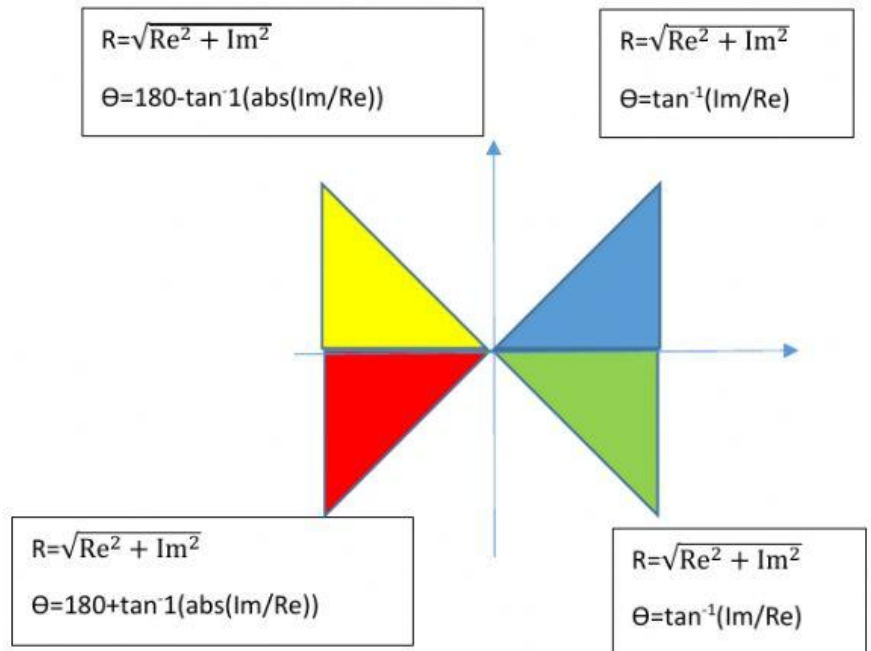
Step 5: write $1/Z$ in Cartesian form:

$$1/Z = (\text{Real}) + (\text{Imaginary}) j = a + bj =$$

Using Complex numbers to solve RLC Circuits – M2 Worksheet

Step 6: Now find out in which quadrant of the state space $1/Z$ is located and then convert $1/Z$ to the polar form:

$$\frac{1}{Z} = r \angle \theta =$$



Step 7: Now flip $1/Z$ to find Z (total impedance):

Guidance: when you flip a complex number in polar form you need to flip r and just change the sign of angle, as it is described below:

$$Z = \frac{1}{r} \angle -\theta =$$

Step 8: Now that you found Z in polar form you can easily convert it to the Cartesian:

$$\text{-----} = r \cos(\theta)$$

$$\text{-----} = r \sin(\theta)$$

$$Z = \text{-----} + \text{-----} j$$