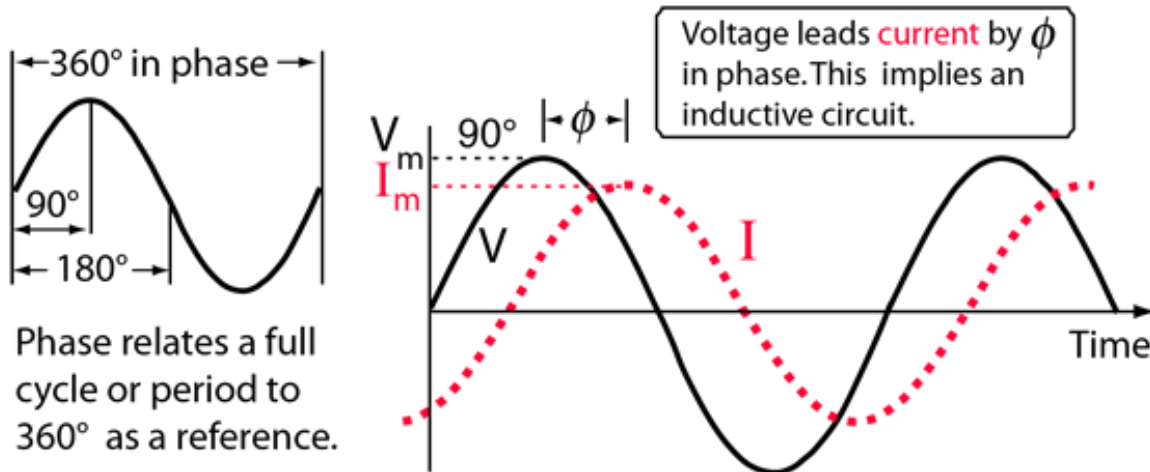
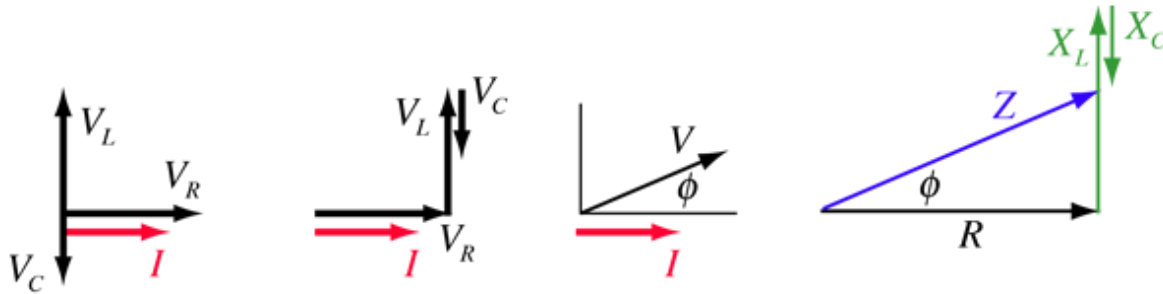


Phase:

When capacitors or inductors are involved in an AC circuit, the current and voltage do not peak at the same time. The fraction of a period difference between the peaks expressed in degrees is said to be the phase difference. The phase difference is ≤ 90 degrees. It is customary to use the angle by which the voltage leads the current. This leads to a positive phase for inductive circuits since current lags the voltage in an inductive circuit. The phase is negative for a capacitive circuit since the current leads the voltage.



It is sometimes helpful to treat the phase as if it defined a vector in a plane. The usual reference for zero phase is taken to be the positive x-axis and is associated with the resistor since the voltage and current associated with the resistor are in phase. The length of the phasor is proportional to the magnitude of the quantity represented, and its angle represents its phase relative to that of the current through the resistor. The phasor diagram for the RLC series circuit shows the main features.



$$V = \sqrt{V_R^2 + (V_L - V_C)^2}$$

$$\phi = \tan^{-1} \frac{V_L - V_C}{V_R}$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$\phi = \tan^{-1} \frac{X_L - X_C}{R}$$

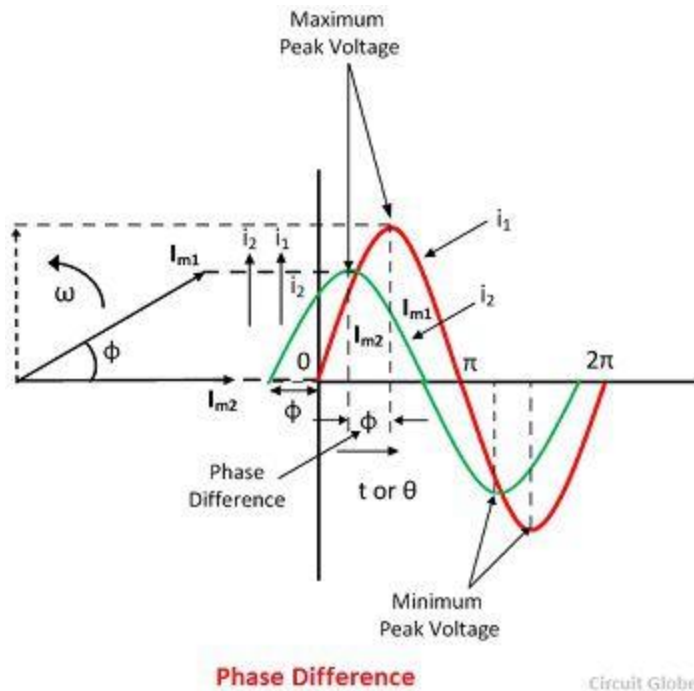
Note that the phase angle, the difference in phase between the voltage and the current in an AC circuit, is the phase angle associated with the impedance Z of the circuit.

Phase Difference:

Definition: The phase difference between the two electrical quantities is defined as the angular phase difference between the maximum possible value of the two alternating quantities having the same frequency.

In other words, the two alternating quantities have phase difference when they have the same frequency, but they attain their zero value at the different instant. The angle between zero points of two alternating quantities is called angle of phase differences.

Consider the two alternating currents of magnitudes I_{m1} and I_{m2} are shown vectorially. Both the vector is rotating at the same angular velocity of ω radians per seconds. The two current obtains the zero value at different instants. Therefore, they are said to have the phase difference of angle ϕ .



The quantity which attains its +ve maximum value before the other is called a leading quantity, whereas the quantity which reaches its maximum positive value after the other, is known as a lagging quantity. The current I_{m1} is leading the current on I_{m2} or in other words, current I_{m2} is the lagging current on I_{m1} .

Cycle: When the alternating quantity goes from through a complete set of +ve or -ve value or goes through 360° electrical degrees, then it is said to have completed a cycle completely.