

Lecture 19, Monday, February 21, 2022

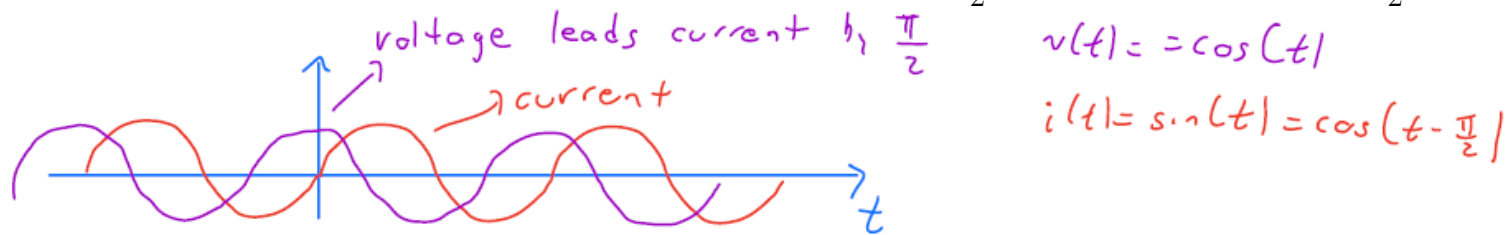
- Phasors

- Can transform ODEs to algebraic equations in terms of phasors using superposition and derivative, then solve for the desired phasor and transform it back to time.
- V-I relationships in phasors for resistors, inductors and capacitors:

$$V = ZI \quad \text{Ohm's law}$$

$$\text{Impedance, } Z = \begin{cases} R & \text{resistor} \\ j\omega L & \text{inductor} \\ \frac{1}{j\omega C} = \frac{-j}{\omega C} & \text{capacitor} \end{cases}$$

- * Voltage leads the current in inductors by a phase of $\frac{\pi}{2} \Rightarrow \angle V = \angle I + \frac{\pi}{2}$



- * Voltage lags (trails) the current in capacitors by a phase of $\frac{\pi}{2} \Rightarrow \angle V = \angle I - \frac{\pi}{2}$
- More generally:

$$Z = \text{Re}\{Z\} + j\text{Im}\{Z\} = R + jX \quad \Omega$$

- * $R = \text{Re}\{Z\}$ is the resistance
- * $X = \text{Im}\{Z\}$ is the reactance