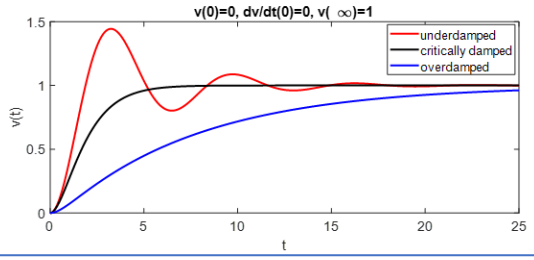
Important Terms to Know for RLC Circuits

- **Resonant frequency**: this is the natural frequency of a combined inductor and capacitor (regardless of whether they are in parallel or series)

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

- The type of roots of the characteristic equation will indicate the damping of the system
  - **Overdamped** – relatively slow to reach steady state value.
  - **Underdamped** – reacts to change in input quickly, but response rings.
  - **Critically damped** – quickest approach to steady state values without overshoot.

Case	Roots	Homogeneous Solution	Response
I	Distinct real roots $s = s_1, s_2$	$A_1 e^{s_1 t} + A_2 e^{s_2 t}$	Overdamped
II	Complex roots $s = \sigma \pm j\omega$	$B_1 e^{\sigma t}\cos(\omega t) + B_2 e^{\sigma t}\sin(\omega t)$	Underdamped
III	Repeated real roots $s = s_0, s_0$	$C_1 e^{s_0 t} + C_2 t e^{s_0 t}$	Critically damped



Example 5: Find the value of $i_0(t)$ at $t = 1$ms.