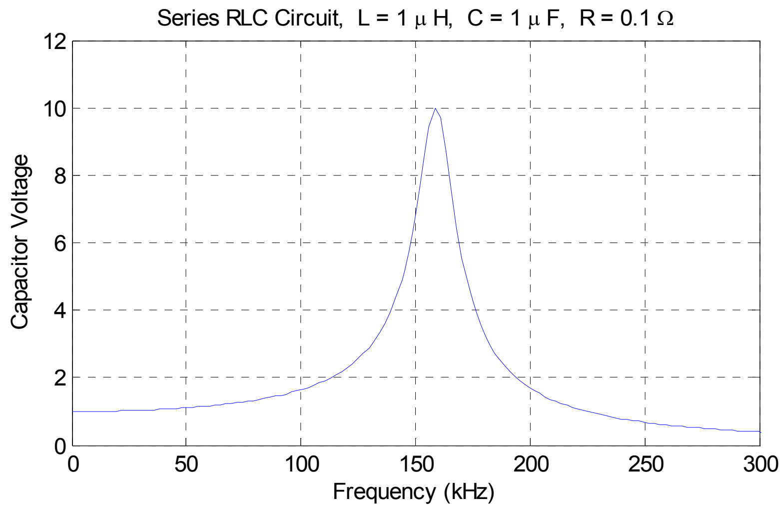
For example, in the plot below, we find that $|v_C| \approx 10V_0$ when the frequency is about 160 kHz.

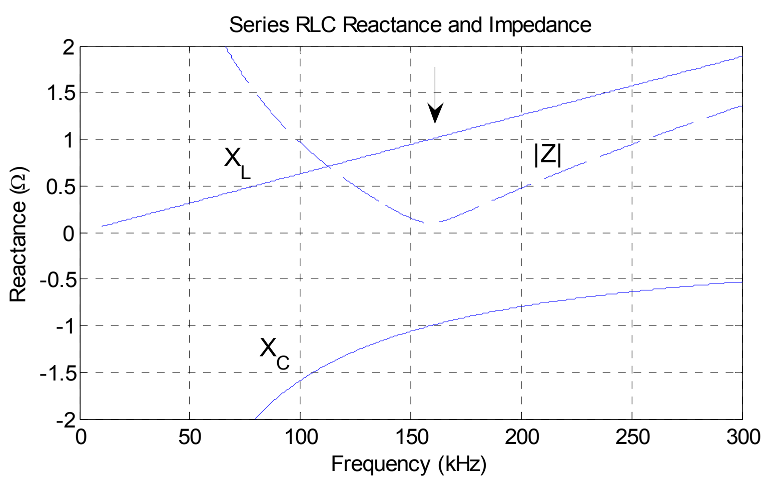


What has happened here is that near 160 kHz, the frequency of the source voltage ω matches a natural oscillation frequency of the circuit, causing a large increase in the voltage across the capacitor.

Whenever we have an oscillating source whose frequency matches a natural resonance frequency in a system, large amplitude changes in some system property will be produced. This phenomenon is called *resonance.*

Resonance occurs in all kinds of different systems – for example, swings, mechanical vibrations, atoms, etc.

We can see how resonance arises in an RLC circuit by plotting the reactances of the capacitor and the inductor together with a plot of the magnitude of the circuit's impedance.



Notice that at resonance, the impedance has a minimum which occurs at the frequency where the reactance of the capacitor, equals the reactance of the inductor. Since the two reactances are 180° out of phase, they cancel each other out.

The *resonant frequency* ω_0 occurs when $\omega^2 LC = 1$, i.e., so

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